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### Concentration of Effort

WITH this issue, AIRCRAFT JOURNAL is consolidated with AVIATION and AERONAUTICAL ENGINEERING. There have been many recent examples of concentration of effort in world affairs and endeavor to meet the many complex internal problems which the United States is facing. A notable example in the aeronautical field was the recent amalgamation of the Aero Club of America and the American Flying Club. As now constituted this body has the undivided responsibility and obligation to supervise the sport of flying and encourage the development of commercial aeronautics. The manufacturers have learned that there must be a community of interest in a struggling industry and have relegated to the background petty trade jealousies while retaining the necessary element of individual competition. One outstanding result of this is the increasing amount and quality of the aeronautical news which appears almost daily in leading newspapers throughout the country. The same spirit is indicated by the strength of the movement toward a single Air Service.

Believing that the best interest of American aviation could be served by merging the authoritative technical semi-monthly AVIATION AND AERONAUTICAL ENGINEERING and the reliable news weekly AIRCRAFT JOURNAL into one comprehensive weekly, this union has been effected and the combined publication will be known as AVIATION AND AIRCRAFT JOURNAL.

The editorial excellence and accuracy which have characterized both publications will continue as a principal attribute of AVIATION AND AIRCRAFT JOURNAL. It will give to the American aeronautical movement a dominant publication from the standpoint of leadership, authority, reliability of editorial contents, and quality and volume of circulation.

### The Gordon Bennett Airplane Race

WITH the disappointing showing of the American entries for the Gordon Bennett race, a tendency is noted among the general public to belittle American aeronautical achievement. We do not think that the results of the race justify this discouragement.

The French winner showed extraordinary skill as a pilot and maintained his reputation of many victories. His firm backed him up by careful ground work. But, the machine employed though suitably refined, and with its wing cut down to a degree which made a safe landing a matter of high skill, showed not a trace of a novel idea. Nor for that matter did any of the other European entries to the race.

The American contestants suffered from hasty preparation, from the creditable characteristic of taking a chance. In the Curtiss machine, a splendid engine and clever aerodynamic design was vitiated by the risky omission of a shock-absorber. Nevertheless, remarkable skill and ingenuity were displayed in the design. The McCook Field entry included a really remarkable engine, and a thoroughly sound design, a single mistake, the provision of too small a radiator, does not decrease the real achievement of the design. The Dayton-Wright entry showed a number of most remarkable developments, well worked out, considering the short time in which the machine was built and which may well mark a mile-stone in aeronautical development, even though there was the fatal mistake of inadequate vision.

It is perfectly proper to bewail the result of the race, to pass censure on the haste and lack of thoroughness in preparation of the American entries. But at the same time, it is only fair to give credit for originality, and courage in design far surpassing that exhibited in the foreign entries.

### The First Real Test

THE inauguration of the first commercial air line between Key West and Havana has a greater significance to American aviation than appears from the early announcements. It will mean that air transport for passengers, freight and mail is to have a well organized and adequately financed trial, something that has not been achieved in this country in spite of all the claims that have been made for such enterprises.

If commercial aeronautics is to come into being as rapidly as it should, men of sound business ability will have to unite with forseeing aviation specialists and both will have to be guided by the experience that will come rapidly. The London to Paris routes have succeeded because of this union of financial and engineering skill and the first American experiment will open the air to commerce if it proceeds as conservatively as good business judgment directs.

The flying boats that will be used are the best that have been produced, the pilots are experienced, the Navy and Post-office Departments are cooperating in every way they can. Success will turn the efforts of all constructors and pilots toward the commercial airplane. The reports of the performances, like the successful achievements of the aerial mail will be the stimulating news American aviation needs.

### United States Experimental Fields

IN the last few months a number of competent American observers have visited the various Government experimental fields abroad. It is gratifying to learn from them that in general efficiency, in freshness of outlook, in rapid adaptability to peace-time conditions in administrative and engineering skill, United States experimental stations rank as high as any similar foreign establishment, and are superior to most. In almost every field of human endeavor, whether music, art, literature, statesmanship, distance seems to lend enchantment.

Without introducing personalities, it may be bluntly stated that in administrative skill, in keenness, the officers at our fields surpass as a body those engaged in similar duties abroad. If they lack the experience which a more prolonged period of war has given to European personnels, they make up for it by a bolder outlook a more systematic encouragement of new types, a greater readiness to welcome new developments, a more helpful attitude towards the industry.

# Aeronautics in Europe

By Alexander Klemin

*Consulting Aeronautical Engineer*

With the very rapid exchange of information which existed between American and Europe during the war, and the still more rapid exchange possible at the present moment, it is not likely that a European visit should be for any well informed man a journey into entirely unexplored territory But a summary of the numerous impressions received on such a trip, may help to confirm or check tendencies in design, and to give a better idea of the trend of the utilization of the airplane, which is perhaps of greater importance at the moment than even rapid progress in design itself

Thus it has become the fashion in this country to attach great importance to the construction of the internally braced monoplane, following on the eminently successful efforts of the Junkers and Zeppelin machines. European designers are fully aware of the possibilities of this type of construction, its apparent aerodynamic advantage, its simplicity, its ease of assembly and maintenance of alignment But, the best informed men are the most open minded on the question. Students of aeronautics well remember that one time the externally braced monoplane was supreme, at another time biplanes alone were built, then triplanes came into fashion

English designers in particular seem to think that the internally braced monoplane is another fashion, and that had airplane construction began with this type, the girder wing truss would have been perhaps met with equal acclaim. It is significant that Dornier, one of the best known German designers, invariably lightens his cantilever truss, with a pair of struts on either side The general opinion seems to be that for certain problems in design the internally braced monoplane will be most suitable, but that it will not become universal, and that to make it universal is a forced idea.

The same doubtful attitude is maintained regarding all metal construction. The Germans were undoubtedly the first to build all metal airplanes with perfect success. In Germany, too, duraluminum had its origin and received the most successful application in rigid construction. Nevertheless with the exception of one or two firms, German designers are not at all convinced that metal will immediately displace wood. The transportation companies in England, struggling as they are with problems of depreciation are not building their new ships in metal. The possibility of breakdown under vibration in steel construction is considered remote, but duraluminum is still regarded as a somewhat uncertain quantity English designers prefer to introduce metal gradually and to let the transformation from wood to metal be enforced

Also the cost of construction in metal is held to be much greater for metal than for wood When ships are built in small quantities and since airplane design is rapidly progressing, it is preferable to meet possible improvements in design by discarding less costly wooden airplanes. An open minded, slightly conservative, and very wise attitude is again apparent.

Apart from internal bracing and all metal construction, in which German designers undoubtedly lead the way, no very radical developments are to be found. In the Ahlis wing and the Handley Page wing, increased wing lift is sought without decrease in efficiency In placing the tanks under the wings, as in a Westland machine, and on the chassis as is a Fokker, there is an indication of the attention given to fire hazards. In the big transportation machines, a conventional airplane design is invariably coupled to comfortable even luxurious internal installation of the passenger compartment

Owing to the special conditions of air travel between England and the Continent, there is quite an active and successful attempt to build amphibians. The absence of radical improvement is clearly indicated by the fact that the British Air Ministry was unable to award its first prize for large land machines in the trials at Martlesheim Heath.

While it is scarcely satisfactory to an observer to note that there is an absence of radical improvement it is more pleasing that there is an overwhelming conviction that American and European designers are on a footing of perfect equality Granted always that the Germans have taken the lead in the use of duraluminum and in internal bracing, no other superiority whatsoever is noticeable in European airplanes.

A Vickers-Vimy is well matched by a Glenn Martin, the Martynside Semiquaver is not a whit better than the Thomas-Morse or Oreneo single seater, and similar comparisons could be drawn for other types British and French designers have perhaps given more attention to interior comfort in the passenger compartment, but this is a question of upholstery for the most part The somewhat poor showing made by the American machines in the Gordon Bennett race, as compared with the victory of the French, is not at all an argument for American inferiority Two French entries completed the course. The English competitor failed to complete his course The winner of the race, Sadi Lecomte, a brilliant and remarkable pilot, employed a Nieuport of perfectly conventional type. The pilot had flown the same machine in race after race, he was on home ground. The American entries showed real originality, a multitude of ingenious ideas, particularly in the case of the Dayton-Wright and it was haste and lack of preparation, and unfamiliarity with the course which was their undoing, not inferiority in design In fact it may be said that the Gordon Bennett, disappointing as it was, showed a superiority of conception and a courage and initiative which are a good augury for the future of American aeronautics.

If a comparison of purely scientific knowledge is made, it may be quite boldly stated that American experimental methods and technical analysis are superior to those of the French, and that there is very little to choose between the aerodynamic methods of the National Physical Laboratory and those of our laboratories. The English show a more profound knowledge of stress analysis. It is only from German scientists such as Prandtl, Betz and others that American scientists can learn lessons which transcend their present understanding Certainly the development of the vortex theory of flight, and the calculation of the characteristics of aerofoils by German scientists is a remarkable intellectual achievement, which outweighs the inherent clumsiness present in the design of so many German airplanes.

It does not seem apparent that the development of military, naval or commercial aircraft is more rapid in France or England than in the States In Germany it is now completely at a stand still But where Europe has indeed a lesson to give us, is in the ever increasing use of the airplane for transportation purposes In the *Times*, the *Daily Telegraph* and other great English daily papers, advertisements of air routes to Paris, Amsterdam and other points appear just as regularly as those of steamship companies. Thomas Cook and Sons will sell a ticket for air travel to Paris or Amsterdam in the same matter of fact manner as a railway and steamship ticket to the same point The various aircraft companies operating airplanes between London and Paris fill their ships to capacity with either passengers or freight. A network of airlines covers the whole of western Europe London, Paris, Brussels, Amsterdam, Berlin, Hamburg, Leipzig, Copenhagen and Malmo are a few of the cities served in this manner One company has carried nearly four thousand passengers with only one fatal accident. Air rates are going down. The transportation work is actually paying There is nothing more hopeful than this in the whole situation, nothing which so impresses the aeronautical visitor to Europe

Aerial taxi business it may be mentioned is doing well in the big centers. Navigation is still somewhat on primitive lines and night flying has not been attempted for transportation work.

The general conclusion to be drawn is that while the extraordinary activity of war time aeronautics may make present efforts appear somewhat small, the utilization of the airplane for transport is steadily growing, has long passed the period of experimentation, and is becoming more and more familiar to the public, and bears the most glowing promise for the future.



# The Short All Metal "Silver Streak"

The Short Brothers all metal "Silver Streak," first exhibited at the Olympia show of this year in experimental form, is reported by the builders to have surpassed their expectations and to have brought a government order The Silver Streak embodies the experience of this firm in the use of duralumin in airship construction, and is extremely interesting as an example of all metal construction, including metal wing covering in the girder type airplane, as distinct from the all metal internally braced machines, with which we have recently become familiar.

| | |
|---|---|
| Lb per sq ft | 7 50 |
| Speed maximum | 120 m p.h |
| Speed cruising | 60 m p.h |
| Range at full power | 250 mi |
| Range at cruising speed | 450 mi |
| Endurance full power | 3 hr |
| Endurance at cruising speed | 6 hr |
| Climb | 10 000 ft. in 11 min |

The outline of the machine is shown in the drawings of Fig. 2 and in the photograph of Fig. 1. The machine is soundly

Fig 1 The Short All Metal "Silver Streak"

The Silver Streak is a single-seater, single-engined tractor biplane, designed to carry mail or light freight to the amount of 400 lb It is designed to take two passengers in place of mail Apart from the use of metal, the machine is built on conventional tractor biplane lines. It is equipped with the 6-cylinder vertical Siddeley "Puma" of 260 b.h.p.

The specifications of the plane as given by the makers, follow

| | Siddeley Puma |
|---|---|
| Engine | |
| Bhp. | 285 |
| Surface | 370 sq ft |
| Span | 37 ft. 6 in |
| Chord | 6 ft 3 in |
| Gap | 5 ft. |
| Length Overall | 25 ft. 6 in |
| Height | 10 ft. 5 in |
| Gasoline tank capacity | 50 gal (British) |
| Oil tank capacity | 6 gal (British) |
| Total weight | 2870 lb |
| Weight empty | 1985 lb |
| Fuel and oil | 425 lb. |
| Crew | 180 lb |
| Useful load | 460 lb |
| Lb. per hp | 11 |

proportioned, the pilot has good vision, and the tail end of the fuselage with the rudder placed above it forms a very clean aerodynamic combination, but beyond this the general design of the machine calls for no special comment. It is in the detail of metal construction that the greatest interest lies.

*Fuselage Construction*

The fuselage of the Silver Streak as illustrated in Fig 3 follows veneer monocoque practice forming a streamlined hollow tube. It is built up of duralumin sheets of moderate gauge, riveted to twelve oval bulkheads of somewhat thicker gauge, of ¾ in. by ¾ in. outside dimensions, made in two parts and riveted together On the inside of the fuselage are twenty-eight horizontal, corrugated stiffeners of sheet duralumin riveted to the skins at intervals round the circumference The first three stiffeners to left and right of the top and bottom seams, are placed somewhat closer together than the stiffeners elsewhere on the circumference

In the engine compartment, the oval bulkheads or formers are replaced by four strongly built box-sections, brackets supporting the two steel tube engine bearers. The brackets are U-shaped frames with rolled and bent edges. The first

bulkhead is just above the front spar of the lower plane, and the second is just above the rear spar of the lower plane. The load is thus well distributed, a similar arrangement applying at the tail strut. The fuselage appears to be somewhat lighter than the ordinary wood truss and fabric type.

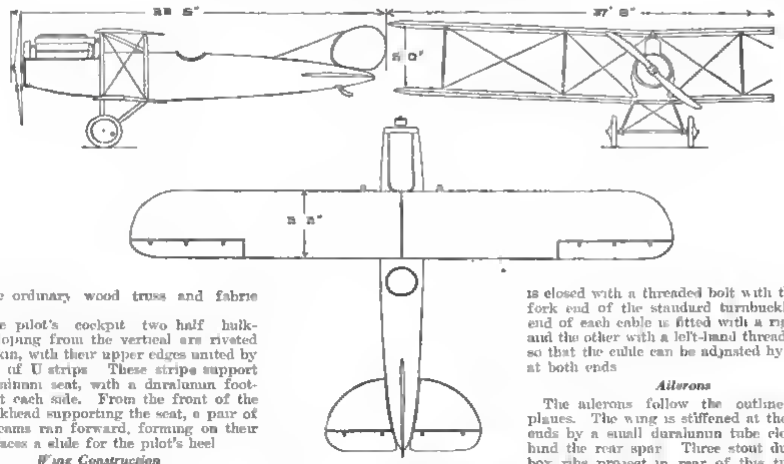



FIG 2. THE "SILVER STREAK"

In the pilot's cockpit two half bulkheads sloping from the vertical are riveted to the skin, with their upper edges united by a series of U strips. These strips support the aluminum seat, with a duralumin footboard at each side. From the front of the first bulkhead supporting the seat, a pair of angle beams ran forward, forming on their upper faces a slide for the pilot's heel.

*Wing Construction*

The interplane struts are of steel. The spars are of steel tubing of 112,000 lb per sq in strength. These struts, the spars and the engine bearers, are the only places where steel replaces duralumin. It is admitted by the makers that the steel tube spars are somewhat heavier than built up duralumin spars might have been, but it is claimed that this is compensated for by easy and effective fittings.

Contrary to the results obtained for the fuselage, the planes have proved heavier than the ordinary wooden wings. The covering of aluminum was unobtainable in thin sheets, the only obtainable gauge being 26 S w g, which probably accounts for the extra weight. Thirty gauge will ultimately be employed for the wing covering.

The danger of buckling, which was overcome in the Junker airplanes by the use of corrugated plates, has been overcome by Short Brothers by using ribs that are deeper throughout than the actual aerofoil, their top and bottom edges being cut and pressed so as to leave a ridge on each side and act as flanges for the sheet covering. A unit is then formed by duralumin rivets through a U-shaped aluminum sheet. The covering is applied in strips of the same width as the space between the ribs, which is 11 in., and extending over the full chord. They can, in case of damage, be replaced without interfering with the other wing parts or the use of special riveting tools. The duralumin ribs slip onto the spars, and are secured by small pins passing through the tube and the rib flange at the hole drilled for them.

The interplane strut sockets are in the form of sleeves and are slipped onto the spars and sweated into place. The sleeves and spars are drilled and the holes steel bushed. An eye bolt and a wiring plate complete the fitting. This arrangement is also found in the drift struts. Stranded wires are employed both for internal and interplane bracing.

Both top and bottom planes are set at a dihedral angle and ailerons are carried, top and bottom. The two spar roots carry box ribs of the same section as the wing proper. On the underside the wing profile is carried right across the body, on the upper surface it is faired into the body.

An interesting variation of the usual turnbuckle is used. It consists of an internally conical steel socket through which the cable end is passed. The strand ends are turned back on themselves and soldered into the socket, the rear end of which is closed with a threaded bolt with the usual fork end of the standard turnbuckle. One end of each cable is fitted with a right-hand and the other with a left-hand threaded fork, so that the cable can be adjusted by turning at both ends.

*Ailerons*

The ailerons follow the outline of the planes. The wing is stiffened at the aileron ends by a small duralumin tube closely behind the rear spar. Three stout duralumin box ribs project in rear of this tube, and the ailerons are hinged on these ribs. The ailerons are suitably recessed for these ribs, so that they are balanced, the line about which they hinge being thus in rear of the leading edge.

*Tail Surfaces*

The rudder is curved into the fin as shown and is balanced. The elevator is divided into two parts by the tapered end of the fuselage, and is balanced in a similar manner to the ailerons. The elevator is without external bracing, and the only outside support for the stabilizer consists of two short struts on the under side, used mainly to make up for the narrowness of the fuselage at that point.

*Chassis*

The landing gear is of the usual two V steel tubes attached to the lower wing spar roots, with a continuous axle, fitted with the usual rubber shock absorber. In addition there is fitted to the base of each V an oil dash pot with a plunger attached to the axle, to prevent bouncing.

FIG 3. THE FUSELAGE CONSTRUCTION OF THE "SILVER STREAK"



# Personal Experiences in Constructing Metal Airplanes*

Digest of a Lecture by Prof. Dr. Ing. H. Junkers

The lecture was divided into two principal parts, an aerodynamic part, treating of the birth of the original idea and invention and the exploitation of the same, and a structural part in which the construction of the metal airplane was described from the first trial piece to the finished vehicle for air traffic just as it had been developed by clear-sighted pioneering work from the airplane of pre-war times.

The first part of the lecture described the work of collaboration with Professor Reissner in Aachen, in 1909, and the commencement of the actual inventive activities which led to the fundamental patent No. 253763 of February 1, 1910. The principal idea of this patent was: Lowering of the resistance and raising of the economy of an airplane by incorporating all parts generating lifting power.

The fundamental importance of the conception on which the patent in question is built up and to which the Kuehler Patent No. 299799 (equally fundamental) is closely related, was shown in detail with the aid of several photographs, and, finally, by a comparison of various means of transportation, it was made clear how the greatest economy in air traffic might be attained, and that in the long run the carrying capacity of an airplane may, in contrast to other means of transportation, become almost independent of speed.

In order to investigate the respective aerodynamic problems which had to be solved before the commencement of the constructive work, an air-tunnel was erected at Aachen in 1914, and later, in Dessau, second one.

The points which above all had to be cleared up by the investigations to be carried out there, were the effect (1) of the contour of the wings, (2) of the curve of the axes of the wings in the two principal directions, and (3) of the thickness of the profile.

These investigations were accompanied by others having a fundamental character, as, for instance, of shapes having equal resistance.

The experiments, which were very numerous, led to the following important conclusions —

(1) That the relative breadth must be as large as possible.

(2) That the flying properties are considerably influenced by the curve of the axis of the profile.

(3) That the thickness of the wings is not only possible but also possesses advantages.

Investigations of the disposition of surfaces resulted in the conclusion that the monoplane must be aerodynamically superior to the biplane.

The second and structural part of the lecture treated first of the reason for using metal in building the Junkers airplanes.

After a short reference to the fundamental difference between bridge building and airplane building, the inherent properties of the building materials were compared with one another and it was finally established that wood can only equal metal for small spans especially on account of its light weight, but that even for these it may be advisable, because of its perishability, the danger of splitting and burning, to employ metal, which among other advantages has those of durability, pliability, and the choice of various possibilities of combination.

In the opinion of the lecturer metal will take the place of wood in airplane construction especially when large parts in one piece are required.

In answering the question as to how the metal was employed, there was occasion for a retrospective review of the history of the development of the airplane in the factory.

The idea of permitting the surface to do the carrying, when the thick profile (which can be considered only when the wings are unsupported) is employed, was first carried into effect by the use of weldable iron, which at that time was available. The very thin web of 0.3 mm. was given tensile strength by covering it with thin sheets of tin. The joining of the parts was done by electrical welding.

The simplest and quickest way of obtaining information regarding the strength of the various structural parts was by putting machines together for testing purposes. From small trial pieces, wings of the desired dimensions were developed and toward the end of 1915, the original type of the unbraced metal monoplane was completed and with it the proof that the basic idea was logical. The airplane, which was described in detail, attained a speed of 170 km per hour with a motor of 120 hp. because of its minimum of resistance properties and was aerodynamically far superior to the best types of that time.

As the useful load of the airplane was too small on account of the specific weight of the iron, and as furthermore, the latter had not as yet been sufficiently exploited for all structural parts it was now necessary to turn to another design and lighter material. Duralumin was the metal chosen, and in the new design the wing surface was separated from the supporting parts; thus the exploitation of these parts was much improved.

In this case also, small trial pieces were constructed first, then larger ones, and finally a trial piece 10 m. long, and the results attained with it were compared with the original design.

The fundamental points of this design, which has since been retained almost unchanged, were then described in general with the assistance of numerous photographs and elucidated trial pieces. The factory process of making the standardized parts of the framework-wings was also described. The lecture concluded with an enumeration of the various types of metal airplanes which had up to that time been constructed at Dessau.

After a short reference to the unfinished experimental construction of a monoplane with a rotary motor, the Anderhalbdecker (one and a half plane) with the armored body of the year 1916, which was designed and constructed in collaboration with the war department, was considered in detail, and its characteristics justly appreciated with respect to its merits and demerits.

With this airplane, which it was later possible to build in considerable numbers under the system of standardized parts, extensive experiments were first made.

After the construction of this type had advanced to the point at which the factory could undertake its production, work was continued on a design for the construction of a light monoplane.

In addition to the change of building material used, another model of construction was employed. The hitherto customary design, in which the wings are separated by the body, was now abandoned, and, in spite of all scruples, which later proved unfounded, a continuous wing was executed upon which the actual framework of the body rests. The raising of the center of gravity thus caused, has proved anything but unfavorable even during the most exaggerated stunt-flying. The design was used for the D (pursuit) planes and the C (observation) planes. For the latter there are also floats with corrugated sheet metal skins.

* Translated from Zeitschrift fur Flugtechnike und Motorluftschiffahrt, Feb. 14 1920.

# Fluid Resistance of Streamline Bodies *

By J. R. Pannell, A. M. I. M. E., F. R. AE. S.

The resistance offered by bodies to motion through fluids has for many years been a problem of the first importance, and one which has received a correspondingly large degree of attention both from scientific investigators and those commercially interested in the subject. A considerable amount of mathematical investigation has been carried out, but a detailed study of fluid motion has only proved possible in the case of a perfect fluid, i. e., one in which viscosity is not present. Assumptions have been made as to the quantities upon which the motion of the fluid and the body depends, and formulae have been prepared expressing the laws connecting force and speed for dynamically similar bodies.

In the present note attention will be directed chiefly to the case where the only properties of the fluid upon which the motion depends are the viscosity and density, though brief mention may be made of instances where the acceleration due to gravity is also important.

The familiar example in which the action of gravity affects the motion is that of a naval vessel which sets up surface waves. In such a case the force ($F$) acting upon the body will be equal to

$$\rho v^2 l^2 f\left(vl/\nu, v^2/lg\right)$$

where $v$ is the speed, $l$ a dimension of the body, $g$ the acceleration due to gravity, and $\rho$ and $\nu$ the density and kinematic viscosity respectively, of the fluid. The frictional resistance is a function of $vl/\nu$, while that due to wave making is a function of $v^2/lg$.

Aircraft, like submarine naval vessels, may be regarded as completely submerged in a fluid so that there is no wave making effect at the free surface of the fluid. It appears probable, therefore, that under these circumstances there will be no gravitational effect and that changes of $v^2/lg$ may be neglected†, this conclusion is supported by the experiments which have been carried out on aircraft and models.

It should be noted that in the flight of an airplane the force due to gravitation is opposed by the lift, and in order to maintain horizontal flight of the airplane on an increase in the value of $g$ it would be necessary to reduce proportionally the mass (without change in the form of the machine), or increase $v^2$ by an amount inversely proportional to the change in $g$; the attitude of the machine is, under the condition of similarity, supposed constant. It therefore appears that changes in the magnitude of $g$ are compensated by methods which, as would be expected from the previous statement that the motion is independent of changes in $v^2/lg$, only modify the "flow pattern" due to change in $vl/\nu$.

The forces on an airplane would be directly calculable from experiments on a model if the latter were carried out at the same value of $vl/\nu$ as for the airplane. For aircraft this is rarely possible and a knowledge of the form of the function $f$ is therefore necessary in order to make accurate predictions from models.

In experiments on models of naval surface vessels, however, it is possible to secure the value of $v^2/lg$ appropriate to full-scale. Thus, so far as the major portion of the resistance (that due to wave making) is concerned, naval architects have an advantage over designers of aircraft in the prediction of performance from models. The prediction of the remaining skin-friction resistance, which may amount to as much as 40 per cent of the total, is carried out by an empirical process based on Froude's experiments with flat boards. The air resistance due to the superstructure of the vessel is ignored.

In aeronautics perhaps the most important practical application of information as to the resistance of bodies of approximately streamline form is in connection with the design of airship hulls, since such resistance represents a large proportion (perhaps 60 per cent in a rigid airship) of the total resistance of the aircraft. In such a case the large dimensions of the hull render experiments at the same value of $vl/\nu$ extremely difficult; in a wind channel observations would be taken at approximately the same speed and the model would be about 1/150th full size. Under these circumstances it is obvious that the prediction of full-scale airship resistance from experiments on models is rendered uncertain unless, at the highest value of $vl/\nu$ at which experiments can be carried out in a wind channel, the resistance be found to vary accurately as the square of the wind speed, and the "square law" holds up to the full-scale value of $vl/\nu$, accuracy is here a matter of importance since if only a slight variation is taking place an increase in $vl/\nu$ to 150 times its wind channel value offers ample scope for an important change in the resistance coefficient. If the resistance vary as the square of the speed a non-dimensional coefficient, $F/\rho v^2 l^2$, may be employed to calculate the forces on the actual airship.

Experiments on models show that on many airship forms there are marked departures from the "square law" though fortunately in wind channel experiments on many low resistance forms the change in the coefficient becomes less rapid as the wind speed is raised, and it is possible that a comparatively small increase in the speed, though not affording a value of $vl/\nu$ materially nearer full scale, would carry the results to a region where the coefficient was sensibly constant.

The remaining portion of this note will be devoted to a consideration of experiments carried out at the N.P.L. on a series of "streamline" bodies.

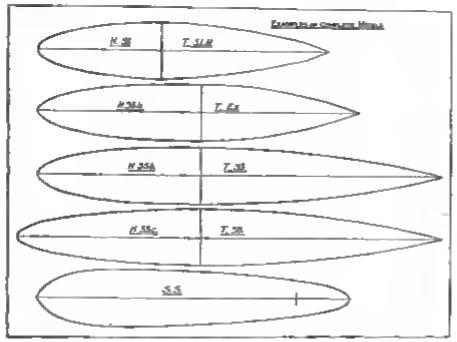
### *Resistance Experiments on Streamline Bodies*

Experiments were carried out at N.P.L.§ in a seven foot wind channel on a composite model having a maximum diameter of six inches. There were four alternative forms of head, five forms of tail, and a number of cylindrical portions which could be inserted between the head and the tail. Measurements were also made on a model of the envelope of airship "S.S. 60,000," and on four models sent by the Admiralty, one of which proved to have a lower resistance coefficient on a unit volume basis than any other model examined at N.P.L. In this connection it may be noted that a "one-piece" model is likely to have a lower resistance than a composite model of similar form due to slight unavoidable irregularities in the surface of the latter. The composite model is, however, believed to be satisfactory for indicating the general lines upon which low resistance bodies should be designed.

These experiments were carried out in connection with the design of airship hulls, and the results expressed in terms of a coefficient $C$ for comparison on an equal volume (i. e., equal lift) basis. The coefficient is calculated from the following formula:—

$$C = F/\rho v^2 l^2$$

where $F$ is the force on the model, $v$ the wind speed, $l$ the cube root of the volume and $\rho$ the density of the fluid. It should be borne in mind that the body giving the lowest value of $C$ will not form the best shape for fairing a disc of the same maximum diameter in normal presentation, in this case a much shorter form will give the optimum result. Throughout the present note resistance on a volume basis only will be considered.




Examples of Complete Airship Models Tested at the N.P.L.

Fig 1 depicts four of the more important combinations of the composite model and "S.S. 60,000" for purposes of comparison. By an oversight the curve of head H.33 at the after end was not made parallel to the axis, and H.33b was designed to provide a somewhat similar head free from that defect. In designing a head it was discovered that an ellipse gave a form approximating to those of the heads illustrated. The tail T.S.L.M. consists of a series of truncated cones. The form of U.72I, which was found to have such a low resistance coefficient, approximates to that of the combination H.33b, T.E., but with a somewhat reduced fineness ratio.

Before considering the numerical values it may be noted that the results show very clearly the important errors which may arise if experiments are carried out on small models at low speeds. For many combinations of head and tail (for instance H.33b, T.E.) the effect of introducing cylindrical body was at low values of $vl$ negligible, and in some cases resulted in a decrease of resistance, at the higher values of $vl$ the introduction of cylindrical body of a length greater than one half the diameter caused an increase of resistance which grew rapidly with the length of the cylinder.

The main conclusion arrived at in these experiments may be briefly summarized as follows:—

(1) A tail 2.5 diameters long can be made to give as low a resistance coefficient as any tail yet examined.

(2) A form 4.6 diameters long can be produced which will give a resistance coefficient of 0.007, which compares with 0.013 for "S.S." 5.2 diameters long. The forward curved portion of such a body may be elliptical, and must be at least 2 diameters long. There should be no cylindrical portion.

(3) For all the models examined, except certain ones with T.S.L.M., the introduction of cylindrical body causes an increase of resistance coefficient at the higher values of $vl$; with T.S.L.M. the introduction of more than one diameter also causes an increase.

(4) In forms which include more than one diameter of cylindrical body, a tail 2.75 diameters long, composed of a series of truncated cones, may be used without appreciable increase in the resistance coefficient at the high values of $vl$.

In conclusion, it may be stated that at present there appears to be no reliable method by which the resistance of a streamline body may be calculated. It has often been suggested that the skin friction resistance may be calculated from a coefficient determined on a plane surface; but the skin friction coefficient applicable to streamline body varies markedly for bodies of similar surface roughness, but of different form.

A calculation of the resistance coefficient of model U.721, using a skin friction coefficient recently obtained at N.P.L. in a preliminary experiment on plate glass, resulted in a value of the order of *twice* the measured resistance. Recent experiments at N.P.L. on low resistance forms* indicate that the force obtained by integrating the normal pressures over a model in the wind channel is zero, to the order of accuracy of the experiments, so that in those cases the resistance may be regarded as due entirely to the tangential force.

* Courtesy of *The Aeronautical Journal*.

† An additional term should be introduced for compressibility of the air, but this does not appear to be of importance at present flying speeds.

§ Report of the Advisory Committee for Aeronautics R. & M. 607—"The Effect of Form on Resistance."

* Reports of the Advisory Committee for Aeronautics. R. & M. 600 "Distribution of Pressure over the surface of Airship Model U.721."

## Tenders for Canadian Aircraft

The Air Board of Canada recently sent a memorandum to the leading aircraft manufacturers of Great Britain calling for tenders on some special types of machines which are required for next year's operations of the Air Board. These aircraft will mainly be used for photographic exploration and forest protection and the following types are provided for in the memorandum:—(1) single-engined airplane, (2) single-engined float seaplane, (3) single-engined flying boat, and (4) twin-engined airplane.

The Air Board intends to purchase one machine of each type after exhaustive trials to be conducted in Canada, to standardize the types found most suitable and to then order them in quantities. Delivery of machines will be required on or before March 1, 1921.

For exploration work machines will have to be capable of making long flights away from their base, because the country is rough and uncultivated, while airports are few and far between. For this reason, also, very reliable engines will be required for these aircraft.

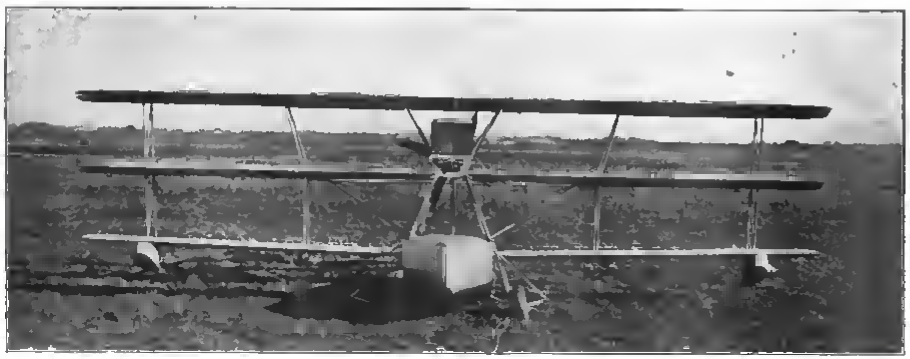
As to forest protection, the memorandum emphasizes that the only months free from snow and ice in the northern parts of Canada are April to November. Therefore, if aircraft are to operate all the year round, provision must be made on all aircraft to land on snow and ice. One of the greatest problems in this connection is the fact that for a time in the spring and the fall it will be difficult to find either open water for seaplanes to land upon or yet ice sufficiently strong to bear the weight of the machine at rest.


The Ansaldo S/V.A. Two-Seater (220 Hp. S.P.A. Engine) Which Won the 240 Km. Race at the Recent Antwerp Aviation Meeting

# The Sperry Amphibious Triplane

One of the most important achievements in the development of American aircraft, is represented in the Sperry Amphibious Triplane This development represents a feat that will tend to increase very considerably the usefulness of the airplane for naval and military, and commercial uses. The principal advantages in this plane are

(a) Greater latitude of use
(b) Larger choice of landing and taking off places.
(c) Increased safety
(d) Greater flexibility of operation.
(e) Choice of hangar location.



Front View of the Sperry Amphibious Triplane

Concerning the greater latitude of use possible with this plane, this will apply to any particular service in which the airplane may be engaged, but is especially true in connection with naval uses, as it is possible to utilize it to better advantage for night bombardment, submarine day bombing, reconnaissance, fleet operation, coastal patrol, and as a means of communication between a fleet at sea and an army in the field. For bombardment work, which requires an extended flight over water, and for such work as bombing an enemy base, the Sperry machine carries its full load under conditions of calm air or other adverse conditions which would prevent a seaplane from getting off at all with full load.

Due to a saving of weight in the hull and other parts a useful load of approximately 3000 pounds can be carried. In addition to this it is possible to land on water or on land under the most favorable conditions existing. In other words the pilot can pick his own landing place. If the water be rough he can easily land on the beach or some other ground. When operating from a ship this plane can be flown off of the deck of the battleship and after completing its reconnaissance can readily land alongside in the lee of the vessel under practically any sea conditions, and then be hoisted on board.

With this type of plane it is not necessary to build the hangar at the water's edge. It may be located inland, thereby saving considerable expense, and affording greater protection from weather as well as enemy gun fire. Under conditions of heavy seas or ice floes seaplanes are not able to leave their hangars because of the danger involved in getting off whereas this type of plane is entirely serviceable under all conditions. In addition to this the ordinary seaplane requires a crew of several men to launch it or put it in the hangar The Sperry plane can be launched or put in the hangar by its flying crew

When flying over land with this plane the engine may stall or other trouble may develop, and even though the country for miles around may be very rough, wooded, or covered with swamp and marsh, it is possible to glide to the surface of a lake or river, and make a safe landing. This may result in a saving of the aviator's life, or prevent the loss of time and expense incidental to a wrecked machine

The Sperry triplane is so constructed that for special service the wheels may be dropped after getting off of the land with full load, thereby saving 300 pounds without impairing its performance, and at the same time, increasing the cruising radius.

The amphibious machine is a safe connecting link between an army on land and a fleet operating off shore. For landing parties it should prove useful as it would be possible before sending a force ashore to reconnoiter the country thoroughly, making sure of the enemy's location, taking photographs, and collecting other important information

This plane is essentially a flying boat, with the addition of a set of landing wheels that are rigged into the boat by the aviator by simply pulling a small cable, by releasing this cable they are readily set into position for landing on land

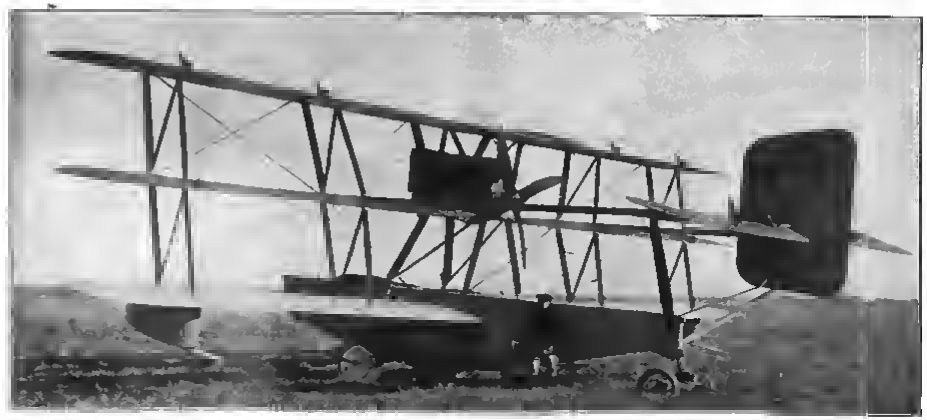
For operating with the fleet this machine is carried aboard ship. With a short run it can get off the deck on its own wheels without the use of a catapult, thereby taking advantage of the speed of the ship combined with the wind's speed. Thus far out at sea the machine can get into the air when it would be too rough to launch a sea plane from the sea.

For coastal patrol the machine will have the same advantages over certain classes of land and sea planes that it has in connection with night bombardment, the load instead of being made up of bombs would be principally of gasoline, which will allow the patrol to extend a greater distance at sea in scouting for an enemy fleet than either a strictly land or sea plane which in turn means an interception a greater distance at sea. If the patrol is desired simply along the coastline where long stretches of marsh and inland bays are traversed, the machine will get down into these bays or land inside of where the waves break, on a combination of wheels and boat taxiing up and on the beach, where a land machine or seaplane would be wrecked or unable to get up again.

***Specifications of Sperry Amphibious Triplane as a Bomber***

MODEL B

| | |
|---|---|
| **General Dimensions** | |
| Wing span, upper plane | 48 ft. |
| Wing span middle plane | 48 ft. |
| Wing span, lower plane | 48 ft. |
| Depth of wing chord | 66 in. |
| Gap between wings | 66 in |
| Stagger, per plane | 13 in. |
| Length of machine overall | 31 ft 6 in |
| Height of machine overall | 15 ft 4 in |
| Angle of incidence | 4 deg. |
| Dihedral angle, lower wing only | 2 deg. |
| Wing curve | R A F 6 |
| Sweepback | 0 deg |
| Horizontal stabilizer, angle of incidence | 3 deg |
| **Areas** | |
| Wings, upper (including ailerons) | 245 4 sq ft. |
| Wings middle (including ailerons) | 219 sq ft. |
| Wings, lower | 213 8 sq ft. |
| Total supporting surface | 678 8 sq ft. |
| Ailerons, (upper 96 sq.ft. middle 40 sq.ft.) | 76 sq.ft. |
| Horizontal stabilizer | 66 4 sq.ft. |
| Vertical stabilizer | 15 8 sq.ft. |
| Elevator | 48 sq ft. |
| Rudder | 21 8 sq.ft |



Three Quarter Rear View of the Sperry Amphibious Triplane

| | |
|---|---|
| **Weights** | |
| Net weight of machine empty | 4711 lb |
| Bomb gear | 115 lb |
| Fuel for 6 hours, 92 gals | 642 lb |
| Oil 7 gals. | 48 lb |
| Pilot, one | 190 lb |
| Passengers, two | 360 lb |
| Total with light load | 5056 lb |
| Bombs (4) 230 lb. each | 920 lb |
| Total with full load | 5976 lb |
| **Engine** | |
| Model Liberty 12-cylinder, V type water cooled | |
| Horsepower rated at | 400 |
| Weights per rated horsepower including radiator and water | 6 0 lb |
| Bore and stroke | 6 in x 7 in |
| Fuel consumption per hour, engine wide open, 96 6 gal. | 614 lb |
| Fuel tank capacity | 124 gal. |
| Gravity tank capacity | 11 gal. |
| Total gas capacity | 106 gal |
| Oil tank capacity | 11 gal |
| Fuel consumption per brake horsepower per hour | .51 lb. |
| Oil consumption per brake horsepower | .0379 lb. |
| **Performance** | |
| Loading per sq ft of supporting surface with light load, 5056 lb | 7 4 lb |
| Loading per sq. ft. of supporting surface with full load, 5976 lb | 8 8 lb |
| Loading per sq. ft. of supporting surface with full load without landing gear, 5681 lb | 8 35 lb |
| Loading per horsepower for light load 6838 lb | 12 5 lb |
| Loading per horsepower for full load, 5976 lb | 14 9 lb |
| High speed full load | 91 m p.h. |
| Landing speed full load | 63 m p.h. |
| High speed light load | 91 m p.h. |
| Landing speed light load | 46 m p.h. |

***Some Technical Features***

Besides the extremely useful feature of the amphibious gear, and the very large useful load, the novel lift truss is extremely interesting, as is shown in the photographs. The rear exposed wiring is dispensed with, loads being carried from the rear truss to the front truss by fore and aft tension struts

The number of linear feet of exposed wire is 223 ft. which is significant when it is compared with what it would be in the normal biplane lift truss which would be 616 ft. This feature alone saves 240 lb. of head resistance at 100 miles per hour or 65 horsepower at that speed.

By reduction in length as per N-C practice, and by innovations in constructional details such as all battens of tee section, struts similar to those used on the M-F flying boats and square lines of hull the weight of the hull has been reduced to approximately 589 pounds.

One of the features of the machine is the high tail and its rigid mounting which consists of two tubular spars connecting the tail with the intermediate surface, together with the third support for the tail surfaces, which is tail of the hull, thus giving the tail a true triangular outrigger support This high disposition of rear surfacing permits the tail surfaces to withstand abnormally rough sea, without injury, and at the same time it eliminates the detrimental effects of the instability, longitudinal and directional, due to the tortional slip stream in back of the propeller

The feature of dead-motor seaworthiness is gained by a folding drag skid, which makes the machine lie tail into the wind. This is of paramount importance in rendering the machine seaworthy, since it has been determined that not only is the machine more stable in the water with tail into the wind, but it can be steered in this state when running before the wind and at least 20 deg each side of the wind The drag skid is attached underneath the tail of the hull, which can be drawn to a vertical position when resting on the water by motion of a single lever When in a vertical position the drag skid retards the tail just enough to hold the tail into the wind at all times. Lying in this relation to the wind the stability of the machine is enhanced, because,

(a) The upsetting effect of wind on the surfaces is nullified or reduced to a very low factor because each puff of wind shoots over the machine instead of under it, whereupon not only is the pressure effect less on each portion of the wings due to the negative angle of the wings, but also because there is no water surface reaction, which occurs when the wind blows in the opposite direction relative to the surfaces, caused by the air squeezing between the surfaces and the water

(b) The upsetting effect of rough water is nullified because running before the wind in this relation to the wind and water the machine is passing over the water in such a direction that

when she takes green water over her wing tip the effect is to raise the wing tip instead of depressing it, because the green sea meets said wing at a positive angle rather than a negative one This riding effect of the wing tip is appreciated when one considers that should the wing's tip be acted upon in a downward direction which occurs when riding the waves with nose into the wind, moving astern (as dead motored flying boats always ride) there would be nothing to keep the wing from going under the normal surface of the water and continue on around the machine

The machine will ride the most violent seas if the pilot will be careful in handling the machine because windage will augment the stability of the machine in a rough sea by driving the machine as mentioned above in the proper direction thus rendering all the normal stabilizing means including pontoons positive, making a structure more stable than a life boat and one that minds its helm

*Sand Test*

A sand test conducted on the wings in accordance with Navy practice, the machine being tested in an inverted position with the leading edge up 15 deg from the horizontal, gave the factor of safety 4 84 On loading, one of the turnbuckles in the inner lift truss, pulling out at the barrel, it not being screwed up far enough, otherwise, the manufacturer states it is probable that the structure would have more than satisfied the factor of safety of 5

### Trans-Atlantic Airship Transportation

The R-34, which made the trans-Atlantic journey, has a gas capacity of 2,000,000 cubic feet, while her next larger successor, the R-38 has only about 2,500,000 cubic feet capacity. However, in all schemes now contemplated for a weekly transportation service between New York and London, ships of a gas capacity of 10,000,000 cubic feet capacity are planned for Such a ship would dwarf anything so far attempted, but there is suggested an air leviathan with as great a capacity as 20,000,000 cubic feet and with a hull more than 1,000 feet in length.

It is figured that to build and operate four large airships of the 10,000,000 cubic foot capacity, providing service between New York and London and carrying both passengers and mails, would need a capital of about $25,000,000 The number of passengers hauled would depend, of course, upon other matters such as the purpose and plan of construction. An airship of 10,000,000 cubic feet capacity would have a disposable lift of 200 tons. Allowing a fourth of this for gasoline, a quantity sufficient for a 5,000 miles flight, there remains a possible weight of 150 tons, or 336,000 pounds, to be utilized.

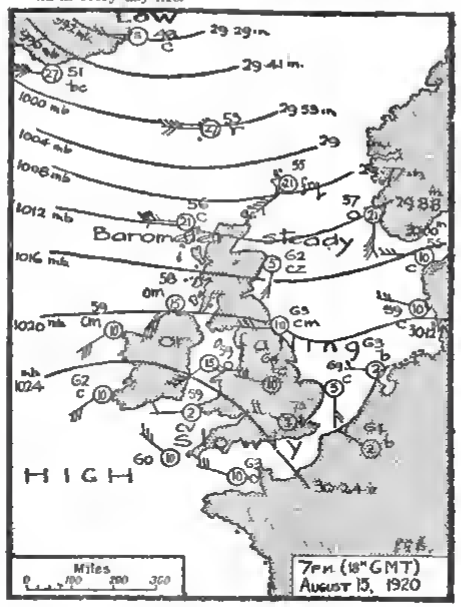
Figuring roughly, 2,000 passengers of an average weight of 150 pounds would only consume 306,000 of our spare pounds, and a crew of 20 would only add, 3,080 more. However, we can not figure our passengers as merely dead weight A voyage of 5,000 miles at a rate of 53 miles per hour would mean a journey of 94 hours or, roughly, four days Such a journey, therefore, would imply food, service, impedimenta in the way of beds, baths, luggage But it needs no efficiency expert to reckon upon a basis of 1,000 to 1,200 passengers, with the necessary food, service and accommodations For the purpose of illustration, we might reckon, of this number, on, say, 300 first class passengers paying each a one-way fare of $500 As for the rest, it is easily calculated. It remains but to build the big ship But, incidentally, it may be hinted, in passing, that our friends, the English, are figuring on an airboat with super-accommodations, one or two self-contained suites *de luxe* to be placed forward on top of the ship, which, they say, millionaires will gladly pay the price for

### No Speed Test Made on Vertville Packard

The statement has been made that tests of the VOP Racer at McCook Field prior to shipment to France for the Gordon Bennett Race, showed that the airplane developed a speed of 100 mi an hour, and that this speed has been checked and verified by the engineers at McCook Field This statement is an error, as no speed tests were made on the airplane. The figure of 100 mi. having been obtained solely by very approximate mathematical computations.

### Weather Reports and Aviation

The accompanying chart and the weather indications which follow are taken from a recent issue of the London *Times*. They illustrate the importance air navigation has achieved abroad in every day life.




### FLYING PROSPECTS TODAY

England, S E., and Channel—Winds will be from some westerly point, averaging 15 to 20 m p h. near the surface. The sky is expected to vary from about half-covered to overcast by cloud at 3,000 ft. or above, while a few slight showers are not unlikely to be encountered locally during the latter part of the day. Visibility should, however, exceed seven miles generally, and no material impediment to cross-country and trans-Channel flying by all species of aircraft appears probable.

The outlook for other districts of the United Kingdom is indicated by the Meteorological Office forecasts, given above.

### AVIATION WEATHER

Sunday August 15, 1920.—Wind Direction and Velocity in the Upper Air.

| District and Time | Height above ground: 2,000 ft Dir m p h | 5,000 ft Dir m p h | 10,000 ft Dir m p h | 13,000 ft Dir m p h |
|---|---|---|---|---|
| Mean | | | | |
| England, N E | W N W 18 | — | — | — |
| England, S | N N W 7 | — | — | — |
| Paris | N N E 22 | N 18 | N 22 | N 18 |
| Noon | | | | |
| England, N W | W 18 | — | — | — |
| England, N E | W 20 | — | — | — |
| Paris | N 27 | N 32 | — | — |
| Even | | | | |
| England, N W | W 28 | — | — | — |
| England, N E | W 20 | — | — | — |

Velocities are given in miles per hour

### New Landing Record

The French aviator Fronval has established a world record for landing at a given spot when he ascended to a height of 1,000 meters and came down within nine feet of the spot indicated. The actual measurement was 2.00 meters Fronval holds the record for looping-the-loop.

# Belgium Wins Gordon Bennett Balloon Race

SUMMARY OF THE RACE

| Pilot | Distance | Landed at | Start | Finish |
|---|---|---|---|---|
| Demuyter | 1100 | North Hero, Vt. | 4 47 1/2 p.m | 0 30 a m., Oct. 25 |
| Honeywell | 1000 | Lake George, N. Y | 4 58 p.m. | 10 50 a.m. Oct 25 |
| Valle | 880 | Homer N Y. | 4 52 3/4 p m | about 44 hr |
| Medori | 675 | Mt Clemens, Mich. | 5 01 p m. | |
| Upson | 675 | Amherstburg Ont. | 5 03 p.m. | 2 10 p m.—Oct 25 |
| Hirschauer | 675 | Mason City Ill. | 4 36 p m | 8 45 p m. Oct 24 |
| Thompson | 622 | Charlotte, Mich. | 4 44 1/2 p.m | |
| Donaldson | 525 | Arowanlawn, Ill. | | 11 50 a m.—Oct 24 |

Lieut. Ernest Demuyter piloting the balloon "Belgica" landed on Lake Champlain near North Hero Island, Vt., at 0 30 a m on September 25, thus being the probable winner of the Gordon Bennett International Balloon Race. It is estimated by officials of the Aero Club of America that he has traversed a distance of approximately eleven hundred miles. The landing, though made in the water, did not cause any injury to the occupants of the basket. Lieut. Demuyter in his telegram to the Aero Club, states that the only reason for not continuing further was a total lack of ballast by the time he reached the lake.

H E Honeywell, pilot, and Dr J Kingsbury, aid, in the balloon, "Kansas City III," are probably the second in the race having landed at Tongue Mountain near Lake George, N. Y. Mr Honeywell states that he was greatly disappointed in not being able to get over the mountain as the surface currents were north and he would have been able to continue much further

The third in the race is the balloon "Andes," Maj. G Valle, pilot and Maj D Leone, aid. This is one of the two entries of Italy It landed at Homer, N Y., after a flight of some forty-eight hours.

Cup Presented by the Civitan Club of Birmingham, Ala., for the International Balloon Race

The start was made at Birmingham, Alabama, on the afternoon of September 24 Capt Hirschauer in the French entry was the first to let go at 4 36 He was followed by Lieut. Thompson, U S Air Service at 4 44½ The third to leave was the probable winner, Lieut Demuyter of Belgium at 4 47½. The others left in the following order Maj Valle, Mr Honeywell, Maj Medori and Ralph H Upson.

The three winners all went in the same general direction while the remainder of the contestants diverged considerably in their routes The majority of the contestants encountered severe storms One of them said that he had passed through three distinct snow storms at varying altitudes. The presence of all these disturbing elements undoubtedly accounts for the wide east-west distribution of the landing places of the various balloons.

Lieut E Demuyter, Pilot of the Belgian Balloon Belgica

This is the first time that a Belgian balloon has won this historic contest. The United States has had possession of the trophy four times, since for two successive years. In order to obtain permanent possession of it it is necessary to win it three successive times. This year's race is the ninth to be held and the first was held in Paris in 1906 The final result of the race will not be determined until the Coast and Geodetic Survey calculates the exact distance covered by the various contestants. The American record is 1,173 miles and the world's record is 1,800 miles.

In addition to the James Gordon Bennett international trophy, the winner will receive two cups, one offered by the Civitan Club and the other by the Birmingham *Age-Herald*. Cash awards totaling $2,800 will be distributed as follows: First prize, $1,000; second, $700, third, $500; fourth, $300; fifth, $200, sixth, $100

A detailed statement of the entries for this race and a review of the former contests was given in Aircraft Journal October 18

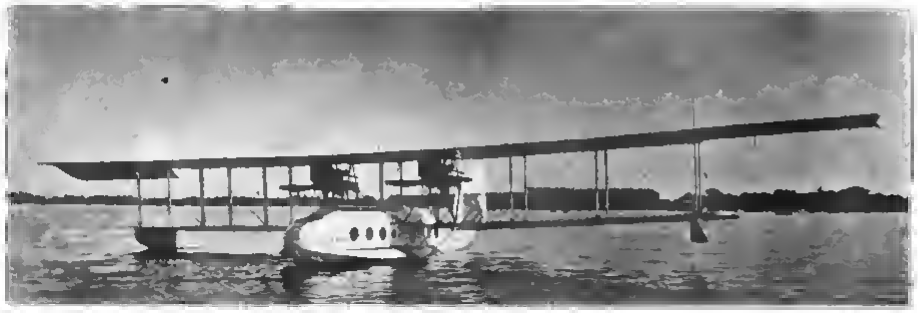
### Finds Marooned Boating Party

A telephone call was received last week from a citizen of Mt Clemens, stating that a motor-boat party from that town which had started on a cruise of Lake St Clair the preceding day, had failed to return, and it was feared they had come to mishap in a storm which had blown up shortly after their departure. It was requested that a plane be sent out over the lake in search of the missing party Word was given to Lieut J B Machle, who, as it happened was about to make a practice flight, and search was instituted immediately. In less than an hour Lieutenant Machle returned with the information that the party had been cast up on an uninhabited island situated about ten miles from the field A speed boat was immediately sent out and the party taken off With the exception of one, woman, who had suffered slightly from exposure, the party was in good shape and were very thankful that their discovery had been expedited by the use of the plane.

# Key West-Havana Route Inaugurated

The inauguration of the Aeromarine-West Indies Airways Transport service from Key West to Havana took place at the Columbia Yacht Club on the Hudson River, New York City, on Saturday, October 23

Two rebuilt Navy F-5-L flying boats which had been converted by the Aeromarine Plane and Motor Co were christened *Santa Maria* and *Pinta* and started on their way to Key West to commence a regular Cuban-American overseas service.



THE AEROMARINE FLYING BOAT "SANTA MARIA"—THE FIRST OF A FLEET OF SIX AIR LINERS BUILT FOR THE KEY WEST TO HAVANA AIRWAY

A luncheon preceded the christening which was attended by many of the men prominent in aeronautics.

John Wetmore, dean of automotive editors presided at the luncheon, having been introduced by Albert Tilt, President of the Aeromarine West Indies Airways. Admiral Glennon, commander of the Third Naval Board representing Gordon Woodbury, Acting Secretary of the Navy, read the following telegram from Secretary Woodbury.

Regret that other duties will not permit me being present at the exhibition and demonstration of your Aeromarine Navy cruiser seaplanes The use of aircraft of this type of sound and proven design substantially as found in Naval Service embodying the highest degree of reliability, durability and safety will do much to establish the utility of commercial aviation at its true value Please assure all interested in commercial aviation enterprises of the Navy Department's appreciation of the value of commercial aviation to the nation's future aerial defense and make clear the Navy's desire to cooperate in every way possible

Major A R Christie, representing General Charles T. Menoher, Chief of Air Service congratulated the officers of the company on their successful inauguration of the enterprise.

Cayetano de Quesada, personal aide to the Cuban Minister extended the greetings of Cuba and read the following telegram from Senor de Cespedes

"I regret immensely not to be able to attend the ceremonies that are to mark the great day in which, a passenger aircraft flying the glorious colors of the United States, will raise itself into space and followed, and impelled by a storm of cheers and good wishes will sail majestically and serenely down the American coast, and across the channel alighting in the bay of Havana, under the guns of Morro Castle and in the shade of the also beautiful and glorious flag of Cuba. This great achievement is a further important step in bringing together our two sister republics and the splendid messenger of Peace will bear on its wings many brilliant promises of progress and civilization for the world at large, as well as of everlasting friendship between two noble and progressive nations. In the name of the Government and of the people of Cuba I wish it Godspeed and have the honor of assuring the ship and its passengers a most hearty welcome

CARLOS MANUEL DE CESPEDES.

Acting Second Assistant Postmaster General E R. White, representing the Aerial Mail Service, Felipe Taboada, Consul General of Cuba, Major Geoffry H Bonnell and Inglis M. Uppercu, President Aeromarine Plane and Motor Co. were the other speakers.

It is planned to start the Key West-Havana service with two cruisers with four more to operate later. These six Aeromarine cabin flying boats are of the largest size ever used for the transportation of passengers. These boats, which have a span of 104 ft. and are fitted with two 400 hp. Liberty engines afford luxurious accommodations to eleven passengers who will be agreeably surprised to find all the comforts a private yacht or a high class limousine offers.

The forward cabin, which is reached through a hatch in the bows of the boats, has six big chairs upholstered with leather, each with its individual window, so that the passenger may have an unobstructed view of the panorama which reveals itself underneath From this cabin a passageway leads to the rear cabin, which seats five passengers and which is intended to be used for smoking writing or card playing. The interior of both cabins is finished in mahogany and silver, and dome lights are provided for night flying. The rear cabin also communicates, by means of a second hatch, with the deck.

Between the two passengar cabins is situated the control compartment, housing the dual control gear, which enables the pilot to surrender control at any time to his assistant, and the necessary air navigation instruments, such as air speed indicators, revolution counters, pressure gauges, compass, etc. Three men make up the crew of the Aeromarine flying cruisers, two pilots and a mechanic.

While the passengers are entirely sheltered against the rush of air and the weather by the enclosed cabins, the pilot compartment is an open cock-pit in order to give the crew the greatest possible visibility in thick weather.

### *Flying Boats Are Well Tried Craft*

While the manifold advantages which a regular passenger air line between Key West and Havana would afford to the traveling public have for a long time been obvious to keen observers, it is realized at the same time that to run such a service with the reliability the public would be justified to expect demanded extremely dependable aircraft. The latter did not exist prior to the Great War.

The aircraft used on the Key West-Havana air line is a development of the so-called F-5-L flying boats which the United States Navy produced during the war for extended anti-submarine patrols, both in home waters and in the North Sea. The splendid war record of the F-5-L flying boats prompted the Navy Department to retain them as part of their peace time establishment. Squadrons of these boats have been attached to the Atlantic and Pacific fleets and have accompanied our battle squadrons far out to sea in the capacity of long range scouts. Several of them have successfully made trips between New York and Florida in the hands of Navy pilots and one of them succeeded last spring in establishing a new world's duration record for seaplanes by remaining continuously in the air for twenty hours and nineteen minutes, thus covering an estimated distance of 1250 nautical miles. This distance slightly exceeds the longest leg the famous N-C flying boats covered in their trans-Atlantic flight.

The desirability of converting the F-5-L boat into a comfortable passenger carrier impressed many students of aeronautical affairs, and as a result the Aeromarine Plane and Motor Co. of Keyport, N J, produced last summer such a craft. The machine is called the Aeromarine Type 75 Navy Cruiser

When the Post-office Department requested bids on a contract to carry first-class mail on a daily schedule between Key West and Havana and return and awarded the contract to the Aeromarine West Indies Airways, Inc., all that remained to be done with regard to the equipment was to duplicate this well-tried type of machine. This work has proceeded at the plant of the Aeromarine company with record speed, two of six boats are completed and the remaining four will be ready in a few weeks.


AERIAL ROUTE FROM NEW YORK TO HAVANA FOLLOWED BY THE AEROMARINE FLYING BOATS

### *Organizers of the Air Line*

The question of the personnel is one of the most delicate that confront air transport firms, for it is the efficiency of both pilots and mechanics that determine the reliability of an air line. The pilots, who fly the machines, and the mechanics, who keep them in trim on the ground, naturally must be selected with the greatest care. Pilots and mechanics were taken from among the best men both of the American and British air forces.

REAR ADMIRAL GLENNON, CUBAN ATTACHE C. DE QUESADA AND ASSISTANT POSTMASTER GENERAL WHITE
(C) *Underwood & Underwood*

The vice-president and general manager of the company, Major Geoffrey H. Bonnell, late of the Royal Flying Corps, is the direct supervisor of the operating force. Major Bonnell has acquired a great deal of valuable experience in the training and maintenance of flying squadrons during the war, which should prove considerable assistance in establishing and maintaining a high standard of reliability in the operation of the new air line.

Among the pilots who will handle the big planes are Lieut.

(Continued on Page 230)

FORWARD CABIN OF THE AEROMARINE FLYING BOAT "SANTA MARIA"

# AIRCRAFT JOURNAL

## *COMBINED WITH*

# AVIATION AND AERONAUTICAL ENGINEERING

With this issue, the authoritative American technical monthly, *Aviation and Aeronautical Engineering* and the reliable news weekly, *Aircraft Journal* unite and will give each one comprehensive weekly all the features that have made them recognized for years as the two outstanding successful and respected American aeronautical papers.

Beginning this week, the two aeronautical publications which have had the unqualified support of the recognized constructors, engineers, pilots, organizations for the promotion of aeronautics, the Air Services of the Army, Navy and Post Office Department, and operating companies are welded into one weekly magazine under the name AVIATION AND AIRCRAFT JOURNAL.

The new weekly AVIATION AND AIRCRAFT JOURNAL will retain the technical features which made AVIATION the recognized engineering publication of the aeronautical world. It will continue to print the timely features of AIRCRAFT JOURNAL and its enlarged news and illustrated section will give the public each week an authoritative yet popular account of aerial progress from the scientific, manufacturing and operating viewpoints.

Every subscriber to AVIATION AND AERONAUTICAL ENGINEERING and every subscriber to AIRCRAFT JOURNAL will receive the new AVIATION AND AIRCRAFT JOURNAL each week. The combined circulations will give to AVIATION AND AIRCRAFT JOURNAL the largest and most influential number of readers of any American aeronautical publication.

The policy of publishing helpful original articles on all aeronautical subjects will be continued and, as heretofore, petty intrigues and uninteresting personalties will be avoided. An editorial policy which will aim to reflect the best in American aeronautics will be adhered to.

The aeronautical engineer may expect the same carefully edited technical descriptions of new aircraft, engines and accessories that he has received for nearly five years in AVIATION AND AERONAUTICAL ENGINEERING.

The pilot will be kept abreast of the times by the news of all the latest developments in the art of flying.

The constructor will find in the new AVIATION AND AIRCRAFT JOURNAL, interesting detailed descriptions of new aircraft as produced in America and abroad.

The lighter than air news will continue to cover more completely than ever this branch of aeronautics.

Members of aero clubs and those interested in the sport of flying will find the news of meetings and contests expertly reported.

The policies, plans and achievements of the Army and Navy air services will be covered fully in text and picture.

The news and development of the Air Mail Service will be recorded weekly so that the great expansion of this distinctly American utility will be appreciated by those who contemplate entering the field of commercial air transportation.

Air transportation operations throughout the world will be analyzed and translated to the facts that must form the basis of enlisting the cooperation of capital in new aeronautical enterprises.

Advertisers will find in the combined circulation of AVIATION AND AIRCRAFT JOURNAL a medium which they can rely upon to establish contact with the men in the industry, and of the Army, Navy and Air Mail services who influence the design, specification, purchase and production of aircraft, engines, accessories and equipment, as well as sportsmen, companies and individuals operating aircraft throughout the country.

As an indication of the stability and permanency of AVIATION AND AIRCRAFT JOURNAL, it may interest its readers to know that it is the only aeronautical publication printed in its own printing plant.

# AVIATION AND AIRCRAFT JOURNAL

**Issued Every Monday** **Price 15c.** **Four Dollars Yearly**

***For Sale on Leading News Stands***

John W Iseman, late of the United States Navy, Captain T. L. Tibbs, R A. F., who won distinction in France, and Lieut. Alvin W McKaig.

***To Communicate by Wireless***

Arrangements entered into with the Navy Department will enable the big flying boats to keep in communication, through wireless, with the naval base at Key West and its patrol boats operating therefrom. The Key West naval base will also provide the two terminal points of the passenger air line with weather forecasts and storm warnings.

The main idea of the new air line is to give the passengers beside comfort and fast travel, the utmost safety. The machines will not transport passengers in very bad storms, although the mail would probably be carried. It has become the proud tradition of the air mail service that nothing short of a hurricane can deter a mail pilot.

***The Advantages of Air Travel***

As to the advantages the traveler will derive from using a fast flying boat in preference to the steamships which ply between Key West and Havana, these are remarkably similar to the ones which have rendered the London to Paris air line so popular

The saving in time is obviously the most outstanding. This will represent a clear saving of twelve hours in the case of the East Coast train, which arrives at Key West at 5 20 p m, because the boat for Havana does not leave until 10 p m and arrives in the Cuban capital the next morning, at 8 30 a. m. The flying boats, however, are scheduled to take off from Key West half an hour after the East Coast train arrives and will reach Havana at 7 p. m. the same day so that the traveler will be able to dine in view of Morro Castle.

The desire to escape sea-sickness was incidentally one of the strongest reasons which caused so many citizens of Paris and London to patronize the daily passenger air line across the English Channel. Large aircraft, flying through the air at high speed, are virtually immune against the pitching and rolling motions which the average traveler dreads in a sea voyage.

"The christening of the two Aeromarine eleven-passenger air liners *Santa Maria* and *Pinta* marks the first constructive step in the history of American rapid transportation toward the creation of regular passenger air lines such as are operating in Europe with marked success," declared Charles F Redden, president of the Aeromarine Engineering and Sales Co., in discussing the significance of the ceremony.

"What such a shortening of the trip between New York and Havana will mean to the man who is suddenly called to the Cuban capital to transact urgent business affairs or attend to important personal matters is self-explanatory and therefore need not be stressed. The experience of the London to Paris air lines shows that people in a hurry will invariably take the air route in order to escape the delay attendant upon inadequate connections between trains and steamers.

"To emphasize the pioneering nature of this enterprise as far as the United States is concerned, we have named the first three of the fleet of six air liners used on this service the *Santa Maria*, the *Pinta* and the *Nina*—names of Christopher Columbus' caravels."

## Aerial Police Station Opened

The New York Aerial Police Reserve took over the hangars and seaplanes that were secured from the Navy Department on Oct. 23. The station is located at Fourth Avenue and Shore Boulevard, Brooklyn.

Police Inspector John F Dwyer, Commander of the Police Reserve, who presided over the ceremonies, introduced Police Commissioner Enright. Mr Enright told of the preparations made by the air force of the Police Reserve during the war and said it now could be used for regulating air traffic above the city, which is increasing, and to aid the marine division of the police force in breaking up bands of river pirates.

Rear Admiral Glennon through whose efforts the hangars and seaplanes were given to the Police Department, Colonel Hanter, Rodman Wanamaker, Special Deputy Police Commissioner, who is in charge of the Police Reserve, and Inspector Dwyer also addressed the gathering. Police Commissioner Enright went up in an airplane with B. E. Van de Water, and flew above the Bay for ten minutes.

## An Enclosed Cabin Standard J-1

For cold weather flying the Standard J-1 with Hispano-Suiza engine which won the first Wisconsin Aerial Derby has been fitted with a four-door detachable cabin, designed to give complete protection from all the elements and reduce the inconveniences of flying to a minimum. The reconstruction of the plane as an enclosed cruiser is the work of Thos. F. Hamilton, of the Hamilton Aero Mfg. Co., Milwaukee, Wis., favorably known as a manufacturer of high performance propellers.

The cabin is divided into two main parts, the front section covering only the two seats and the rear section extending back


An Enclosed Cabin Standard J-1

to the stabilizer. The front section consists of a framework entirely covered with Pyralin, and so designed that entrance may be had through four doors. This section can be detached in thirty minutes and is a complete unit in itself.

The rear section consists in the main of the baggage and luggage carrier. This compartment measures 8½ ft. long, 30 in. wide and 25 in. deep, and is large enough for a watchman or mechanic to sleep in. On recent business trips to Chicago, with pilot and passenger, two propellers for the Aerial Mail Service were easily carried in the baggage section without disturbing the balance or stability of the plane.

This machine has been flown by Pilot T. F. Otis and the designer, Thos. F. Hamilton and both pronounce it a complete success. The absolute freedom from dirt, flying oil and other distrubances associated with flying is unusual, as are the greater visibility and ease in handling the plane. The manufacturer reports that no reduction in the speed of the plane is observed.

## The Luigi Mapelli Cup Competition

The rules for the contest for the cup presented by Luigi Mapelli to the Aero Club of Italy have been issued. The cup is valued at 50 000 lire and is to be offered in an annual open competition among airplane constructors.

It is to be competed for under F. A. I. rules and will be open to airplanes having a wing spread of not more than six meters overall and driven by engines of a total volumetric displacement up to 4585 cu. mm. The first competition will be held on November 7. Money prizes will be awarded to the winning pilots.

The competition will be for speed and will be flown on a straight or on a circular course, each year the distance flown being doubled. The course must be not less than 150 km., nor less than 600 km. Landing will be permitted.

## To Seize Zeppelin

The inter-allied commission of control has tried to seize the Zeppelin super airplane which has just been completed for a proposed trip from Berlin to New York. The constructors of the 'plane, which was built in Staacken, just outside of Berlin, refused to give it up, declaring the power of the entente to condemn airplanes as being against the armistice regulations expired six months after the signing of the agreement. It is expected that there will be an international row over the incident.



## Pulitzer Trophy Race

The contest committee of the Aero Club of America has sent out notices stating that the closing date for entries in the national airplane race for the Pulitzer trophy at Mitchel Field, L. I., Thanksgiving Day will be November 15. The American entries in the Gordon Bennett races held in France last month will compete with other fast American machines, among them eighteen planes from the Army Air Service. The Aero Club of France has cabled for further particulars concerning the race intimating that French entries will join the contestants which are expected from other countries, including Canada and England.

The race promises to be the fastest event ever held in

A Remarkable Aerial Photograph of Wall and Broad Streets, New York Taken by the Fairchild Aerial Camera Co. Shortly After the Great Bomb Explosion. Air Photography Has Become One of the Adjuncts of Leading News Services, and Has Proven a Profitable Commercial Business

America. The planes will pass the judges stand four times during the race, flying over a forty mile triangular course, making a total distance of approximately 160 miles.

Prizes include the trophy donated by Ralph Pulitzer, which will be competed for annually. Gold, silver and bronze plaques will be awarded each year of the race. In addition to these Liberty bond prizes aggregating $1,800, will be awarded as first, second and third prizes for each class of machines, approximately one fifth of the prize awarded winning pilots going to the mechanics in charge of the plane. There are also $3,300 worth of Liberty bond prizes for the first, second and third place machines irrespective of type or design.

The machines will start at 11 o'clock on the morning of Thanksgiving Day. Those machines believed to have the greatest speed will be sent away from the starting tape first, the others following in their various classes. In this way, the committee believes the race will be one of the most spectacular ever held. There will be no handicap rules for the main trophy and prizes. Arrangements are being made for special trains to Mitchel Field.

## The U. S. Airship R-38

The Navy Department announced on Sept. 22 that latest reports from the officers in charge of the construction of the R-38 at Bedford, England, state the airship will be completed within the next two months. It is not expected that the voyage to the United States will be made before May, 1921. At that time the hangar at Lakehurst, N. J., will be ready to receive the giant dirigible. With the completion of the Lakehurst hangar, the United States will be in the position to construct airships similar to the R-38. At the present time the English hangar is the only one in the world in which such a large dirigible could be built. The R-38 as well as the Lakehurst hangar are the largest of their kind in the world. The latest figures on the R 38 give the following facts: Length, 694 5 feet; diameter 85.5 feet; useful lift, 45 tons; fuel capacity, 32 tons (13 tons available for freight, personnel, etc.); consumption per hour, 180 gallons; cruising radius, 5,600 knots; speed, 60 knots; speed, cruising, 50 knots; complement, 3 officers, 18 men; motors, 6 Sunbeam-Cossack, 350-horsepower; gas volume, 2,724,000 cubic feet hydrogen; dead weight, 33 tons.

## Aero Tariff Urged

C. M. Keys who recently purchased the controlling interest in the Curtiss Aeroplane and Motor Corp. has decided views on the requirements of the aeronautics industry in the form of a tariff which will insure the proper growth of aeronautical manufacturing in this country.

"I do not believe that in the aeronautical field any protective tariff is required so far as new material is concerned," said Mr. Keys, "but the tariff to prohibit the dumping of war surplus aeronautical material in this country is essential, the lack of it being one of the main causes of the present unsatisfactory conditions in this business.

"American airplane business abroad meets its chief competition from missions sent out by France, England and Italy to sell both government surplus machines and new machines made by the manufacturers of those countries, these missions are made in part at the expense of the various governments.

We do not believe that the American Government should go that far, or should, in fact, do anything except lend to the industry an increased measure of cooperation through its State and Commerce departments. As the war surpluses of the world disappear new problems will no doubt arise in which the Government could help; but the present machinery of the Government should be sufficient to take care of them.

"The airplane industry is in part a supply industry for the Army, Navy, Post-office, Fisheries and other departments, and the best policy on the part of the Government would be to buy only what the Government departments need, and to buy at prices that are fairly competitive, except that constant encouragement might well be given to stimulate perfection of design and workmanship.

"My personal judgment is that concentration of the activities of all of the Government departments in essentially air service would probably greatly increase the efficiency of the Government and stimulate the industry, but on this subject there are many contrary opinions entitled to respect."

## Girl Scouts Add Aviation

An aviation badge is to be added to the Girl Scout list, and Miss Laura Bromwell, the woman aviator, is to teach girl scouts the theory of flying. Miss Bromwell war commissioned as a Girl Scout captain by Miss Mary C. Glendenin, head of the field department.

Miss Bromwell will give a series of talks on "Safety in Flying." She declares that to fly will be as simple and easy a mode of travel in 1940 as the automobile is today—and much safer.

Miss Harriet Koster already has received her first lesson—in theory. The practice may not come until 1940.

## Flew to Foot Ball Game

C. S. Jones, manager of flying operations for the Curtiss Aeroplane and Motor Corp., and an alumnus of Middlebury College, flew from Garden City to West Point to attend the Army-Middlebury game recently.

# The Air Mail - An Economic Revolution

*The following article, which appeared in the Auto and Aerial News of San Francisco, is reproduced on account of the remarkably lucid manner in which the economic aspects of air transport are treated. It is articles of this sort which will enable the not-yet-flying public to grasp the enormous changes the advent of air navigation is bound to bring about in everyday life and which will teach the man-on-the ground a proper appreciation of the advantages of civil aeronautics.*—EDITOR.

Overshadowing all other considerations, as big as is the fact that airplanes have crossed the continent on scheduled mail flights, and threatening economic revolution so vast that the whole world may have to be made over again, is the simple statement that postal matter is carried on the big cross-continent flying machines cheaper than it can be carried on contract with the railroads.

Compilers of news dispatches have over-reached themselves in flash introductions to the stories recording the fact and the incidents of the first on-schedule flights of air mail planes. One went so far as to say that the dream of centuries had come true. Rather say this dream came true when the first plane successfully vaulted into the blue and returned to earth without accident, for the man had flown, had realized his ambition to emulate the birds. And when the war fleets took wing and elevated combat to altitudes that made the maneuvering war eagles seem like gnats to the eye, man proved he could more than fly. But all of these facts proved no economic fact. War is a luxury and the airplane was a sort of a cream-puff luxury de luxe of war. The cost of aerial combat is one of the big factors of the present high cost of living.

*Are Rail Lines and Billions Invested in Them Threatened With Dissolution?*

But now the airplane promises to bring about economic changes so vast as to be beyond reach of ordinary minds.

Railroads cannot live by heavy freight revenues alone. Airplanes threaten to deprive them of the fat income from mail, express and passenger revenues. Stating it another way, the airplane threatens to render billions of dollars of capital invested in railroads non-productive, by absorbing the majority of the perishable and light freight and passenger business, especially on long hauls. The truck has already eaten into railroad revenues to a ruinous extent on short-haul business. The passenger bus has already been the object of railroad commission hearings in which the railroads asked abolishment of passenger lines menacing their existence.

Will steam, already groggy in the first round of its bout with gasoline, go down for the count? Will the airplane, entering the transportation field as an economic factor, deliver the knock-out? Will freight lines, robbed of their most lucrative tonnage, be compelled to receivership and dissolution?

There will be thousands, millions of tons of awkward, heavy freight to transport over the present rail systems. But robbed of the bulk of passenger, express and mail, not to say light freight revenue, the railroad will be compelled to charge higher and higher rates for the business that remains. Upkeep, overhead and equipment costs will not recede. Revenues will recede materially. The tax will fall upon the heavy tonnage. Can industry be expected to pay this exorbitant and prohibited tax?

It seems logical to forecast sweeping alterations in the industrial life of the nation. Manufacturing, especially of heavier machinery, will be more widely distributed because of freight hauls. Advances in the use of electricity in the place of coke in melting ores and in forge work will eliminate the factor of fuel haul that now concentrates much of the iron and steel industry of the nation. Readjustments of this industry will tend to make each section of the United States a complete unit of production, each section supplying its own needs, but helping to eliminate the long haul.

Who can say that the airplane, or more probably its big brother the lighter-than-air type of airship, may not solve even the problem of heavy freight transport. Who can say that the trans-continental railroad may not vanish from the face of the earth and that steamer fleets may not vanish from the surface of the seven seas. Economy is the most powerful factor in progress and if the airplane and the airship prove more economical than the rail and steamer lines, the cheaper air transportation will survive, the other methods perish.

*Sweeping Adjustments of Industries Will Result from Airplane Evolution*

The picture is not extreme, it portrays the possible. For in air there will be no rights of way, no obstacles to tunnel through, no deviations necessary in routes. There can be a complete stratum of action every thousand feet up to and beyond ten, each stratum bigger than the entire area of the earth's surface except where mountains bulk through.

And there is nothing so mobile as the air fleet. Unfettered by rail or pavement it can go and come at the beck and call of commerce. Out-of-the-way places will no longer be out of the way. Those that have waited decades for the "railroad to come" will be enabled to pour their wealth into the lap of the world.

There will be brought about huge adjustments in the labor markets—the draft upon other lines of industry for thousands, millions of skilled workmen to build, operate and direct the air fleets. There will be changes in the laws, so that with the huge tonnage aloft the people of earth may be assured safety. There will be entailed readjustments in modes of living and methods of transacting business.

But these problems will be solved if the airplane is cheaper than the railroad train, than the steamship.

If it is cheaper to transport mail by air than to transport it by train, it will be found cheaper to transport the bulk of articles making up the present tonnage of commerce by airplane.

The far places of earth, whose treasures have been inaccessible owing to transportation costs, will be opened to exploitation and will furnish much of the capital that will bring about the economic revolution entailed in transferring freight and passenger business to the air lanes. And it will be capital created by the new economic factor in world commerce, the cheaper than train airplane.

## U. S. Z. D. No. 1 Visits Washington

On October 12, the largest airship in America the U. S. Z. D. No. 1 sailed over Washington City. The ship had made the flight from Langley Field, Va., a distance of 159 miles in 2 hours, the occasion having been arranged by the Army Air Service for the purpose of having a series of moving pictures taken from the airship while in flight. In reality, there were three series of pictures being shot, one being made at Langley of the Z. D. No. 1 taken from another ship, another, a series of the terrain taken from the Z. D. No. 1 itself, and a third being a series of shadow pictures shot from the big ship and showing the shadows made by itself in flying. The ship was in command of Capt. Dale Mabry, with Lieuts. Wilfred M. Clare and Geo. W. McEntire and a crew of five enlisted men.

The Z. D. No. 1 is a non-rigid airship with a gas capacity of 328,000 cubic feet and a cruising radius of 902 miles. Its maximum speed is 60 miles per hour. The two engines are of the Kenault V type, of 220 hp. each. The big ship has a length of 260 ft., height 49.6 ft., width 38.5 ft., with a carrying capacity of 25 passengers.

From Langley Field comes the report that the airship, under the command of Capt. Mabry made a trip to Richmond where they maneuvered over the State Fair grounds. Moving pictures of the complete trip were made by the Langley Field Photo Detachment, over 4,000 ft. of film being exposed. During the trip a very high wind arose, but the return to the field was made without accident and the big ship was successfully landed and stowed away in her hangar. During the whole trip the ship was in constant communication with Langley Field by radio.





## A. S. M. E. Organizes Aeronautic Section

In the field of aviation a good deal of cooperative engineering work has been done, standards have been established, details of construction perfected, interchangeability secured. Nevertheless there still exists the real opportunity for promoting in a large way the broad engineering development having to do with the future of aerial navigation regarded as an essentially international science, art and business.

To this end the members of The American Society of Mechanical Engineers interested in aeronautics have organized themselves into a professional section on this subject.

Side by side with the development of the engineering features of aviation, which are obvious to all, a few minds have for some years been looking beyond the details of construction into the realm of international aircraft problems, and have in fact secured for America a reputation for breadth of vision regarding the future of air navigation throughout the world.

Howard E. Coffin, Jesse G. Vincent, Orville Wright, C. F. Kettering, Elmer A. Sperry, James Hartness, John R. Cautley, Lionel S. Marks, Miller R. Hutchinson, Charles E. Lucke and Joseph A. Steinmetz are among those who have registered in the section.

## Los Angeles-San Diego Airway Started

A new airway was inaugurated Sept. 16 when one of the Mercury Aviation Company's all metal planes made its first flight on regular schedule from Los Angeles to San Diego and return with such prominent men as John B. Miller, president of the Southern California Edison Company; H. M. Robinson, president of the First National Bank; Max Fisher, wealthy Riverside man, and Cecil B. deMille of the Famous Players Lasky Co., and head of the Mercury Aviation Company, and through whose interests and money the all metal planes were brought to Los Angeles.

The plane left DeMille Field at 12 noon and in a few minutes was lost to the eye in the haze of distance. Just one hour and twenty minutes later word was received from the southern city that the plane and its half billion dollar passenger list had made the landing there.

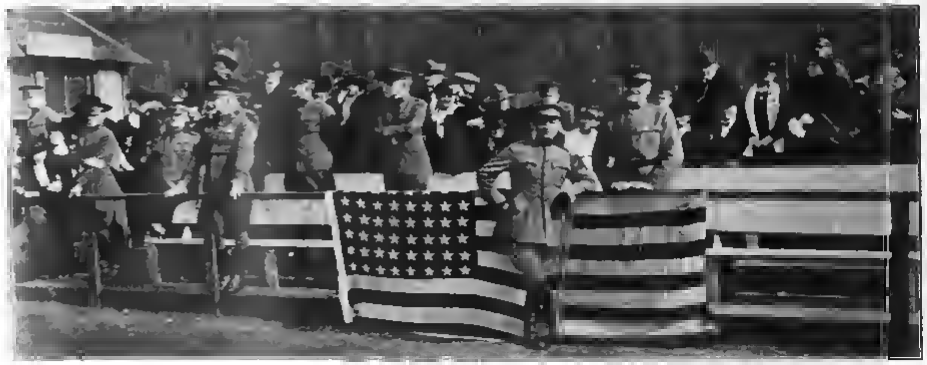
## Japanese Air Training

Report from the Nichiuchi newspapers is that the Japanese navy department has secured the services of thirty British fliers as instructors in the Japanese navy. They expect to open a big flying field early in 1921, and then the training will begin. The Japanese have estimated the expense of the British training to be about $3,000,000.

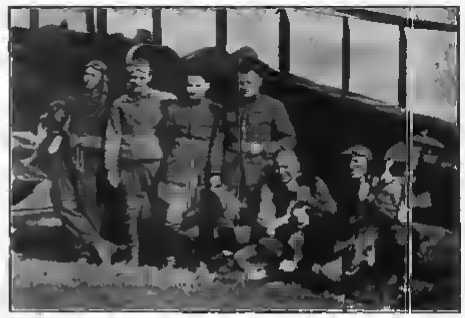
## Alaska Fliers Reach Capital

The four army airplanes which completed a round trip between New York and Alaska on Wednesday have since flown to Washington and arriving in the capital after being in the air two hours.

The same men who brought the planes back from Alaska took them to Washington. They were Capt. St. Clair Street, Capt. Edward Douglas, Lieut. Ross C. Kirkpatrick, Sergt. Joseph English, Lieut. C. M. Crumrine, Sergt. James Long, Lieut. Clifford G. Nutt and Lieut. Eric Nelson. They took with them the sledge dogs brought from Alaska. Six machines of the First Aero Squadron went to Washington as an escort for the long distance travelers.



GENERALS PERSHING, MARCH, AND MITCHELL GREET ALASKA FLIERS AT WASHINGTON
*Photo U. S. Army Air Service*



THE ALASKA FLIERS AT MINEOLA. FROM LEFT TO RIGHT SERGT. JAMES LONG, LIEUT. C. C. NUTT, CAPT. ST. CLAIR STREET, CAPT. HOWARD T. DOUGLAS, LIEUT. ERIC H. NELSON AND LIEUT. C. H. CRUMINE
(C) *Underwood & Underwood*

## Fliers to Make Rain

The latest "rainmaker" project was announced at Port Arthur, Ont., by A. E. Cole, former member of the Royal Air Force.

Cole, with his father, is forming an aerial irrigation company, which, he says, will engage to produce rain at call by sending airplanes up to condense atmospheric moisture by spraying the clouds with liquid air.

## Army Air Service Schools

Without doubt the Army Air Service Schools are among the finest technical schools in the country. So much interest has been exhibited in them that the following curriculum and syllabus of trades taught at the Air Service Mechanics School at Kelly Field, Tex., is given as an example of the thorough and complete nature of this work. All of these courses are either in operation or are ready to function.

*Curriculum and Syllabus of Trades*

*Course for Engine Mechanics.*—Applied mechanics, battery and magneto ignition, overhaul, adjusting and repair, testing, cranking and trouble shooting, installation and testing, advanced field training.

*Course for Airplane Mechanics.*—Airplane repair including woodwork, metal work, wire work, wing repair, fuselage alignment, fabric work and propeller repair.

Engine overhaul and adjustment, installation, testing, cranking and trouble-shooting, rigging and alignment and advanced field training.

*Course for Auto Repairmen.*—Engine mechanics, including overhaul and adjusting, ignition and carburetion, transmission, differential, clutch, starting gears, axles, chassis, overhaul and adjustment, road work, covering driving and road trouble shooting, vulcanizing, motorcycle overhaul, adjustment and repair and field maintenance.

*Course for Machinists.*—Elementary mechanics, bench work, (hand), drill press practice, lathe practice, shaper work, milling machines and grinding machines, gasoline engine mechanics, furnace work and annealing and tempering, machine repair, advanced machine shop practice and machine shop maintenance.

*Course for Electricians.*—Technical electricity, motors, transformers and generators, interior wiring and high lines, telephony and telegraphy, electrical instruments, including A. C. and D. C. switch boards, storage batteries, starting and lighting systems and ignition systems, advanced field maintenance.

*Course for Blacksmiths.*—Blacksmithing, forging and welding, rough tool making, oxy-acetylene welding, electric spot welding, furnace tempering and annealing, advanced tool making and shop practice and advanced field maintenance.

*Course for Aircraft Armament.*—Marlin aircraft gun, including shop and range work, Lewis aircraft gun, including shop and range work, Browning aircraft gun, including shop and range work, fire control gears and range sights, bomb releases, ammunition and pyrotechnics, camera guns and small arms and advanced field training.

*Course for Instrument Repairmen.*—Technical electricity and principles of physics, calibrating, connecting and reading electrical instrument, elementary mechanics and shop practice, pressure measuring instruments, temperature measuring instruments, directional indicating instruments, air speed indicating instruments, time indicating instruments, revolution indicating instruments, installation of instruments and review and advanced field maintenance.

*Course for Parachute Repairmen.*—Folding parachutes, parachute repair and maintenance and testing and field work.

*Course for Army Paperwork and Stenography.*—Army paper work, typewriting, shorthand, English, spelling and study and application.

*Course for Engineer Officers.*—Carburetion and ignition, mechanics of gas engines, cranking, testing and trouble shooting, mechanics of airplane construction and repair, motor installation and testing, rigging and alignment, engineering forms and parachute maintenance and repair.

Instruction in the following trades has not been authorized to date, and has been incorporated in the courses now being carried on: Carpentry and cabinet making, coppersmith, fabric work, magneto repair, metal work, motorcycling, propeller work, vulcanizing and welding.

The Training Department personnel of this school consists of nine officers, twenty-one enlisted instructors, fifty-six civilian instructors and three hundred and ninety-three students—fourteen of which are student officers, eight student officers are attending the course in aircraft armament and six the engineering course.

## The Cost of Air Travel

"The aircraft will in due time become a form of transportation almost as economical as the automobile, if not more so," says Col. Jesse G. Vincent, one of the designers of the Liberty engine and now vice president of engineering of the Packard Motor Car Company of Detroit.

He declares that the actual cost of carrying a passenger a mile is already less in many aircraft than it is in automobile, and predicts that the high price of machines which so far has placed aviation out of practical commercial use will soon be changed. With this, he declares, will come the preparation of landing fields in every little municipality; guide signs and signals will be provided which will make possible a great volume of air traffic.

"For many years the idea that the automobile would ever supplant the driving horse was doubted and people even refused to believe that it would replace the draft horse in trucking and farming. Nevertheless this also is coming to pass," he says.

"The same will be true of aircraft in a very short time. The fact that there are aircraft today which carry six passengers at a rate of 100 miles an hour and make ten miles to the gallon of gasoline, proves that flying is not necessarily expensive. I know of no automobile that at the same speed will show such fuel economy, and, in fact, a six-passenger automobile that will give ten miles to a gallon at thirty miles an hour is considered a very efficient machine.

"The greatest factor in favor of aircraft, however, is that it requires no rails or even a road to travel on. With the element of road building eliminated, you have a tremendous saving which can be credited to aerial travel. Landing fields can be easily and cheaply prepared, and every little municipality will have one in the near future. There will be guide signs and signals to direct the aviators in landing in foggy weather, as well as in clear, and these are all that will be required for the coming machine. Tire cost also will be included in the saving, because the wheels run for only a few hundred yards in taking off and landing. Until recently the repair bills have been large because of the character of the machines and lack of skill in landing. This has now been almost entirely eliminated.

"So the matter will resolve itself to one of the first cost of the vehicles. The cost of aircraft is still beyond the reach of the average person, but that will soon be changed. There are a number of foreign machines today that can be produced by manufacturing methods like those which have made the motor car so cheap, and I predict that the automotive manufacturers will soon achieve as great a triumph with airplanes. With the airplane reduced to standardized manufacturing terms it immediately becomes a commercial possibility that will place it within the reach of men who will use it not merely for sport, but to save time.

"I do not mean that the airplane will ever supplant the motor car. It will be an ally rather than a rival. It is a fact that no form of transportation ever invented has become obsolete. There still remain certain activities in which the most primitive vehicle has its use and in which it will probably continue to serve until the end of time."

Col. Vincent expressed the conviction that American automotive engineers will actually be able to improve on any present design of aircraft. He prophesied especially that the all-metal type plane may, as he said, "be reduced to manufacturing terms by the same men who made Detroit the automobile center of the world."

## Poland Wants American Planes

Col. P. Cedric Fauntleroy, commander of the famous Kosciuszko Aviation Squadron of the Polish army is en route to the United States. He was recently promoted to the rank of colonel in the Polish army, and has been authorized by the Polish Ministry of War to recruit pilots and endeavor to buy American airplanes for the Polish air service.

Poland has made and is still making every effort to obtain the release of Capt. Merton Cooper, of Jacksonville, Fla., who was recently captured by the Russian Bolsheviki. He is believed to be a prisoner in the hands of the Soviet army near Kiev, and offers have been made to Moscow to exchange any prisoner of any rank for him.

# The Trans-Pacific Flight

The next great flying operation to engage the attention of the whole world is the crossing of the Pacific ocean. Looked at from any point of view, it will be the most difficult feat attempted by aircraft, and the man who succeeds in the undertaking will have won the highest place in the annals of aeronautics.

As early as March, 1920, it was announced that the United States Navy had in preparation two boats of triple engine power designed especially for trans-Pacific flying.

Of the two routes proposed for crossing the great expanse of water, one stretches from San Francisco to Hongkong, China, a distance of 7,616 nautical miles. Stops could be made at Honolulu, Wake Island, Guam and Manila. These jumps measure approximately, as follows: San Francisco to Honolulu, 2090 miles; Honolulu to Wake Island, 2000; Wake Island to Guam, 1320; Guam to Manila, 1320; Manila to Hongkong, 675.

The shortest route possible, however, would follow somewhat closely the great circle steamship route, and would cut the distance to, approximately, 3500 or 3700 nautical miles. Supposing the flier to hop off from Victoria, his first jump would bring him to Sitka, thence next to Unimak Pass in the Aleutians, and on to Yokohama.

While the more northerly route offers the advantage in point of distance, so long as we are in the present experimental stage of knowledge as regards aeronautics, other questions suggest themselves that must be taken into consideration before a choice could be determined. The fogs familiar to the great circle route would add to the flier's difficulties provided they extend to a very great altitude into the air lanes. It is probable, however, that fairly good visibility would extend, say, to 20,000 feet above sea level from December to February, during which period the fogs are less apparent.

In the region, also, high winds, another factor to be reckoned with in the flying calculations, come, broadly speaking, from two main sources and operate in two different directions. A strong south-easterly wind from southern Japan sweeps up across the Pacific to the Aleutians, while from South America gales sweep up the coast in a northwesterly direction.

It must be borne in mind, however, that one of the indispensable aids to trans-oceanic flying, the directional wireless, which came into general use during the last two years of the war, proved its efficacy in the trans-Atlantic flight, giving bearings accurately in spite of wind and mist, and leaving to the navigator the simple matter of plotting accordingly.

While plans are being considered on this side for the trans-Pacific flight, from England comes the announcement that an airplane is being built for a flight from Sidney, Australia, to San Francisco. From Sidney to the Fiji Island the jump would be 1,748 miles; to Honolulu, 2,736 miles, thence to San Francisco, 2090 miles.

It is a pretty safe guess, however, that the first trans-Pacific Flight, like the first trans-Atlantic, will be made by an American flying an American built machine.

In anticipation of the event and of its logical results, a schedule of trans-oceanic flights might be made out reading somewhat as follows: Halifax to Ireland in two days, New York to Liverpool, two and a half days, San Francisco to Sidney, three days; Vancouver to Yokohama, three and a half days; around the world in twenty-eight days allowing for four stops of two days each.

These figures, much as they excite the imagination, are an longer staggering, and cool, clear-headed, calculating business men are putting not only a lot of thought, but also, a lot of hard cash, into projects that they expect will make their dreams come true.

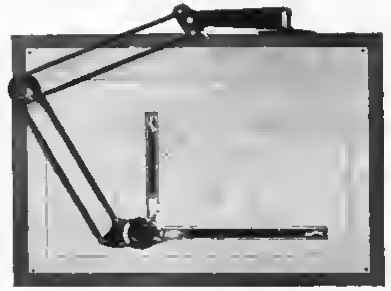
And now, with our routes fairly well-defined and our timetable announced, it remains but to construct our ocean-flying aircraft to suit the needs of trans-oceanic transportation. As to the construction of the machine itself, and for matters of comparison, let us remind ourselves that the NC-4, first airboat to cross the Atlantic, is of the type known as a tractor biplane, is equipped with four Liberty engines of 400 horse power each and each weighing 825 pounds. The length of the boat is 68 feet over all, with a hull measuring 45 feet. The total wing area is 2380 square feet, the upper wing measuring 126 feet, and the lower, 94 feet. Without crew and equipment, it weighs eight tons, and, loaded for its trans-Atlantic flight, it weighed 14 tons. It is capable of carrying fifty people with the necessary impedimenta.

It is reasonably safe to predict that the plane that performs the trans-Pacific flight will be larger, perhaps, twice as large, as any of the NC class. This without regard to any announcement that may have been made, but simply by reason of the fact that everything now, both here and in Great Britain, points to bulk in aircraft building.

When it comes merely to a matter of aerial acrobatics in the crossing of the ocean on wings, or for the purpose of carrying important mail or passengers dispatched on a special mission, the question of size need not intrude itself. In the heavier-than-aircraft, of course, the smaller the machine and the less parasitic weight the better, so long as it holds up and does its highly specialized work.

## The Universal Drafting Machine

Equipped with an engineers' protractor such as is used in plotting the courses of Naval vessels, the Universal drafting machine should be found of value in indicating and locating aerial navigation courses. By using it, aerial routes may be



THE UNIVERSAL DRAFTING MACHINE

quickly and accurately mapped out by drawing the courses on maps. Then relying on the compass as his guide, the navigator should easily determine by means of the protractor, the direction of the course to be followed, and by use of the scale it is a simple matter to determine the distance to the next turning point or the desired destination.

This machine, primarily intended for the drafting room where accurate and rapid work is desired is manufactured by the Universal Drafting Machine Co., 16 Warren St., New York. The combined scale and ruling edge permits lines to be drawn the proper length, thus eliminating much erasing. One advantage that is claimed for this apparatus is that an matter where the scale is placed on the board, and its companion scale held at right angles to it, is that it is always parallel to its original position, thus making the use of the T-square and the triangle unnecessary. This parallel motion is obtained by the use of four light steel arms pivoted at the ends to yokes, an as to form parallelograms.

The scales are held firmly by a rotatable head, carrying a circle graduated in degrees. In this way angles may be measured without the use of any other protractor. One advantage is that the scales may be easily removed and straight edges or different scales substituted. An adjustment is provided to obtain a right angle between the scales. The arms are provided with either plain or ball bearings. Several types of special attachments are available.

### English Air Mail Rules

Any post office in Great Britain will accept letters, postcards, printed papers, commercial papers and samples, whether registered or unregistered for transmission by air Unregistered packets may be posted in any public letter box Parcels and insured papers for transmission from the Cricklewood Aerodrome at special rates must be delivered to the agents of Handley Page Transport Ltd The post office charges the ordinary foreign postage in addition to an air fee of 2 pence per ounce, for Paris or Brussels, 3 pences per ounce for Amsterdam A special blue label is supplied free at any post office for each packet. If a label is not available the cover should be clearly marked "By Air Mail" in the top left hand corner

Express delivery to destination requires an express fee of 6 pence per packet, and the word "Express" must appear below the words "By Air ail" Correspondence posted in London in the morning is delivered in Paris in the afternoon, or late evening if sent by the afternoon service, prepaid for express delivery. Brussels delivery takes place in the afternoon. Express packets to the Hague, Amsterdam and Rotterdam are delivered same day as posted; ordinary correspondence to Holland and Belgium by first post next morning

By connecting up the ordinary mail services the air mails save twenty-four hours in the delivery of correspondence to Switzerland, Italy, Spain, Portugal (via Paris) and Germany, Austria, Hungary, Sweden, Denmark, etc., (via Brussels) Correspondence which misses the Thursday evening's mails for India, Egypt, Aden, Ceylon, Straits Settlements and Hong Kong will secure the connection if posted by mails from London to Paris on Friday morning The same applies in certain weeks to mails for Australia.

There is an aerial mail service from Toulouse to Morocco (Rabet) on Tuesday and Saturdays, connection with which will be secured by posting in the country on Sundays and Thursdays in time for the London night mail and in London by last post on the same days. The air fee is one shilling for packets up to one-half ounce, over one-half ounce to three and one-half ounces two shillings and over three and one-half ounces to seven ounces three shillings. All packets must bear the words "Par Avion De Toulouse a Rabat" in addition to the blue label

To secure connection with the London Air Mails provincial correspondence should be posted daily in time for the night mails for London.

The Handley Page Service has carried from September 2, 1919, to September 25, 1920, 3,479 passengers, 171,613 lbs. of freight and has flown 251,760 miles.

### Airplane Locates Stolen Cattle

A unique method of locating stolen animals and of running down cattle and horse thieves has been tried in South Dakota.

Around the first of October Sam Jefferies an aviator flying for the Aberdeen Aero Company, was retained by Oscar Olander, a rancher near Isabel, S D, to help in the hunt for a herd of cattle that had been stolen from his grazing land.

Jefferies and Olander started in their flight from Isabel and after flying over the surrounding territory for a while they noticed some cattle grazing in a certain locality.

Four herds were sighted. The fourth herd was recognized by the ranch man, and they flew back to the ranch where Olander acquainted his cowboys with the find and told them the location of the cattle. The cowmen went to the plane and brought the cattle home. The thieves, however, were not located

Jefferies is now preparing for a flight with a rancher living near Firesteel, who has had some horses stolen. $100 will be the reward for the return of the horses and $500 for the capture of the thieves. The aviator feels confident that if the thieves are anywhere near the stock they will be captured.

### The Airplane in Politics

That the airplane may be used for political propaganda is indicated by the New Jersey Harding and Coolidge Flying Squadron that is flying over the state dropping Republican printed matter

### Woman's Flying School

The first flying school for women has been opened in England, where an aspirant may learn all the ins and outs of aviation for a fee of $500

# Second Annual Aviators' Dinner

The Dinner Committee of the Second Annual Aviators' Dinner has already arranged for over 2500 to attend this year's reunion, which will be held at the Hotel Astor, New York, on Armistice Night, Thursday, November 11th.

Without a doubt this will be one of the greatest celebrations of its kind ever held in America.

This Dinner is to be strictly an Aviator's affair to which only aviators and the members of flying clubs and their guests are invited The interesting feature of this occasion is that it is the second of the annual Squadron Reunions of the overseas aviators who flew over the lines during the recent war.

The squadron commanders of the various overseas squadrons have written to every man of their late commands to come back to New York and sit at the squadron table for this reunion. Each squadron assembles at its own table Naval aviators, balloons and flying field groups are to be seated likewise The Americans who fought with the British and the Americans who fought with the French are separated into their respective classifications.

There will be no speeches. Major generals and second lieutenants will rub shoulders and will pay the same price for the dinner, there being no free list. The Committee has arranged to have a burlesque and comic skits that are dear to the hearts of aviators, which will be interspersed between courses throughout the dinner A number of prominent actors and members of the Lambs Club are co-operating in the entertainment

It will be necessary to reserve hotel accommodations in advance for that night. Uniforms may be worn The Committee requests those who look after the post-war affairs of squadrons to communicate with them at 11 East 38th Street, New York.

From responses received by the committee in charge of the Armistice Night Dinner, the reunion of American Fliers this year will be a great success. Arrangements have been made for a special train from Boston to bring the New England Delegation, and responses have been received from former service pilots located in all parts of the country.

A special feature of the evening will be the presentation of Aero Club of America medals of merit to the winner of the Gordon Bennett balloon race, and to the pilots who formed the Army's Alaskan Flying Expedition.

The committee urge that all interested in making this event a great reunion, send their checks for $10 00 to the Armistice Night Dinner Committee, Aero Club of America, 11 East 38 street, New York, at the earliest possible date.

The Dinner Committee is as follows: Charles W Kerwood, *Chairman*; Colo J Younger, *treasurer*; Eddie Rickenbacker, James B Taylor, Jr, Commander A. C Read, Elliott Springs, Chas Hanson Towne, Harold E Hartney, F L La Guardia, Maurice J Connolly, Charles J Biddle, Douglas Campbell, Joseph Knowles and H. A. Bruno.

Fishing for Halibut and Barracuda from a Goodyear Pony Blimp in the Pacific Ocean near Los Angeles



# America's First Airship Line

IN California, the first dirigible airship line in America carries passengers between Los Angeles and Avalon on Catalina Island.

The carrier is a Goodyear Pony Blimp, the right-of-way is the sky, the terminals are the waters of Avalon Bay and a hangar on the mainland.

In sixty minutes the Pony Blimp makes a thirty-nine mile flight, saving two hours over the usual journey by land and water, and four hours on the round trip.

So, little by little, do we see the inevitable day brought closer when airships beyond today's conception will carry great passenger and freight loads.

In this development Goodyear deems it a privilege to work, to have the opportunity of the pioneer to master the great secrets of lighter-than-air flying.

If you are interested in airships for sport, for survey, for commerce, write to The Goodyear Tire & Rubber Company in Akron, Ohio, or Los Angeles, California.

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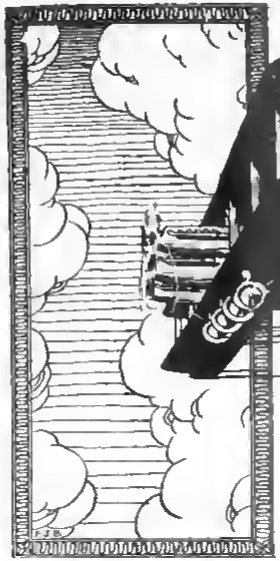

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STRENGTH REPUTATION SERVICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT CIRCULATION ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of AVIATION AND AERONAUTICAL ENGINEERING published semi-monthly at Highland, N Y for October 1, 1920

State of New York
County of New York ss

Before me a Notary Public, in and for the State and county aforesaid personally appeared George Newbold, who having been duly sworn according to law deposes and says that he is the Business Manager of the AVIATION AND AERONAUTICAL ENGINEERING and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption required by the Act of August 24, 1912 embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit

1. That the names and addresses of the publisher, editor managing editor, and business managers are

Name of Publisher, Gardner Moffat Co., Inc Post Office Address, Highland N Y Editor, Lester D Gardner 22 East 17th St., New York, N Y Managing Editor, None Business Managers, George Newbold 22 East 17th St., New York

2. That the owners are (Give names and addresses of individual owners, or, if a corporation give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.)

The Gardner, Moffat Co., Inc., 22 East 17th St., New York, N Y Lester D Gardner 22 East 17th St., New York, N Y W I Beaman 22 East 17th St., New York N Y W D Moffat, 22 East 17th St New York N Y Margaret K Gardner 23 East 17th St., New York N Y

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are None

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Sworn to and subscribed before me this 11th day of October, 1920

(SEAL) FRANKLIN H BROWN
Notary Public, Kings County No 603
Certificate filed in New York County

My commission expires March 30, 1921